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I.

THE TECHNIC OF EXAMINATION OF THE STATIC
LABYRINTH.

BY

ISAAC H. JONES, M. D., AND LEWIS FISHER, M. D.,

PHILADELPHIA.

So little has been known of the physiology of the static labyrinth until comparatively recent times, that the lack of a well established technic of its examination is not surprising. The value of the contributions of Ewald, Högjes, von Stein, Alexander, Neumann, Shambaugh, E. R. Lewis, J. G. Wilson, Ruttin, and others is now, however, beginning to receive the recognition it deserves. By far the greatest impetus to this work was given by Robert Bárány, who in the last decade brought out the "caloric" and "pointing" tests—contributions which brought him the Nobel prize. With these tests came the realization of the intimate relation of the internal ear to the rest of the central nervous system. We know now that the static labyrinth is only the labyrinth of the vestibular apparatus—this vestibular apparatus consisting of the static portion of the internal ear and nerve paths connecting it with nerve centers in the brain stem, cerebellum, and cerebrum.

Originally, tests of the labyrinth were carried out for the sole purpose of determining its own integrity. Such tests were sufficient for the aural surgeon who was called upon to decide whether or not to operate on the "end organ." With the development of the idea that the labyrinth is only one portion of the vestibular apparatus, came the realization that this whole apparatus was being tested at the same time that the internal ear itself was being tested, and that an intelligent interpretation of the phenomena obtained by such tests can also give the examiner an insight into the condition of those various brain paths and brain centers in relation with the internal ear. Thus, when a known stimulus is applied to the labyrinth, any response obtained therefrom, be it nystagmus or vertigo, indicates not only a functioning and reacting labyrinth, but also intact pathways from the labyrinth to the brain centers responsible for those reactions. Conversely, the nonappearance of any of the normal responses to stimulation indicates an interruption at some point along the particular pathway that fails to produce that particular response. This made it evident that the old technic of examination of the static labyrinth was very inadequate, and Bárány elaborated a new technic. Recent investigations by writers in the department of neurootology at the University of Pennsylvania, under the service of Dr. B. Alexander Randall, have shown that the fibers from the so-called horizontal semicircular canal have an entirely separate course in the brain stem from those of the vertical semicircular canals, and while they all go to the cerebellum, we consider that those from the horizontal canal reach it by way of the inferior cerebellar peduncle, while those from the vertical canals go by way of the middle cerebellar peduncle. Bárány's technic, elaborated before such a differentiation was demonstrated, deals with the labyrinth as a whole, whereas in the light of this new knowledge, it at once becomes evident how important it is to examine each set of canals separately.

We also became convinced that nystagmus and vertigo are distinct and separate phenomena, and that, furthermore, the "past-pointing" of Bárány is not a "cerebellar pull," but is a cerebral phenomenon exclusively, and depends entirely on the vertigo induced by the ear stimulation. This again necessitated the modification of some of the existing tests as well as

the employment of some new ones. Above all, it is of prime importance that the technic be accurate, complete, and painstaking, if the data obtained from such an examination are to be relied on. We would suggest that those who appear to be doubtful of the value of these tests must ascribe their disappointment to laxity in methods of conducting them. This point has been impressed on us by the statement of one of the leading men in the profession, who claims that the "Bárány tests" had been routinely employed in his cases and proved of no value. We found that he had used no turning chair. Another authority reported a case in which there was an absence of the normal past-pointing, and yet operation revealed a normal cerebellum. We found that this physician did have a turning chair, but that it was not equipped with a "stop pedal"; we have frequently seen cases examined without a stop pedal in which no past-pointing was obtained, and on testing them with our chair with the stop pedal, we were able to produce past-pointing of a foot or more.

The technic about to be described has been employed in the examination of hundreds of cases, and the deductions drawn from them have been verified in many instances by operations and autopsies.

When we first began examinations of the static labyrinth, a great difficulty was encountered in the recording of the findings, or rather in the lack of recording them. All who have done this work realize what an unspeakable nuisance it is to keep haphazard records, on slips of paper, perhaps, of the results obtained from the various vestibular tests. For example: "On turning to the right the patient's nystagmus was horizontal to the left of so many seconds, but his past-pointing was so much for the right arm to the right, and so much for the left arm to the right," etc., etc. We all know how hopeless it is to attempt the analysis of a case from such records. To obviate this difficulty we gradually formulated the accompanying chart, in which all the tests are outlined in the order in which they are usually undertaken, and which is so arranged that when properly filled in it shows all the vestibular data simply by a glance at one page. We think this chart is of so much help in the examination and diagnosis of a case that it

is actually a part of the technic, and we will, therefore, describe it. (Figure 1.)

One side of the chart is devoted to miscellaneous details or such routine matters as are found on any chart, with particular emphasis on the examination of the cochlea. The other side is devoted exclusively to the vestibular tests, of which there are three divisions, as follows:

1. Spontaneous.
2. Turning.
3. Caloric.

There is a complete column for the "nystagmus," and another complete column for "pointing." This enables us to study the nystagmus as such by running the eye down the column to the left, showing first the spontaneous nystagmus, then the nystagmus after turning, and then after the caloric test. In the same way the pointing tests can be studied as such by following right down the page, first the spontaneous, then those after turning, and then after douching.

As a further aid there is a space reserved on the chart for summarizing the findings obtained after each form of examination. As we always look for the following phenomena—nystagmus, vertigo, past-pointing, and falling—they are indicated concisely, one underneath the other, in each one of the three subdivisions. The examiner, after he has turned the patient, simply summarizes by indicating "nystagmus normal" or "absent"; vertigo, either "normal" or "subnormal," or "exaggerated" or "absent," as the case may be, and so on in the same way under the other headings. When the chart is filled in as we have indicated, and an analysis of the case attempted for the purposes of diagnosis, all the examiner need do is to look at these different summaries under the three main subdivisions to get a bird's eye view, as it were, of the whole case.

We will imagine we are examining a patient and conducting the tests step by step, with the aid of the chart. The "miscellaneous side" of the chart is filled in first, taking up every heading indicated and filling it in with appropriate information—the name, the age, and so on, with emphasis on the history of dizziness, for the reason that there can be no impairment of the vestibular apparatus without dizziness as a symptom. The duration of the dizziness, its character, when it was first

noticed, whether it came on gradually or suddenly, whether the attacks came on with sudden change of position—as, for example, on getting out of bed in the morning, or when washing the face—whether nausea or vomiting accompanied it—all are noted.

Staggering.—Did it come on suddenly or gradually? Is it constant or does it come on intermittently? Is its presence coincident with dizziness? Is it at any time severe enough to make the patient fall? If staggering and falling are present, is it always in the same direction?

Tinnitus.—The presence or absence of tinnitus is of considerable importance, since it might be an aid in the differential diagnosis between peripheral and central lesions. We would expect tinnitus to be present in affections of the labyrinth itself or in lesions of the so-called “end organ” type—whereas it would be more likely to be absent in those disturbances of the vestibular apparatus located within the brain.

Deafness.—Its duration, and whether the loss of hearing was gradual or sudden, are noted.

Nose and Throat.—A routine examination is made with a view of discovering some evidence of focal infection which might account for the presence of an irritative disturbance of the vestibular apparatus, should the rest of the examination point that way; also, for any abnormality which might throw some light on any possible intracranial condition, such as palsies of the tongue, pharynx, or vocal cords, anesthetics, or loss of the sense of taste or smell.

THE EAR.

We note the following:

1. Configuration of the auditory canals.
2. The presence or absence of a mechanical obstruction in the canals, congenital or acquired; of the latter there may be impacted cerumen, or other debris or polypi.
3. The presence of inflammation or suppuration.
4. Condition of the tympanic membrane. The length of time necessary to douche before a reaction appears may depend in a measure on the thickness of the drum head. Perforations are looked for, since a “dry perforation” would be a contraindication to douching.

5. Hearing function. This is of the utmost importance in all cases, because a knowledge of the condition of the cochlear labyrinth is frequently of the greatest help in the differentiation between an "intracranial" and an "end organ" lesion. The cochlea is philogenetically the younger and newer portion of the labyrinth, and, therefore, the weaker and less resistant to the action of toxins. A perfectly functioning cochlea would, therefore, per se, presuppose a normal static labyrinth.

The Fistula Test.—This is performed only in cases where there is a chronic suppuration of the ear, and can be carried out with the use of the Politzer bag.

We are now ready for the vestibular tests, all of them being outlined on the "vestibular" side of the chart.

SPONTANEOUS PHENOMENA.

NYSTAGMUS.

The patient is instructed to look straight ahead of him at a distant point, as the effort at convergence when looking at a near object may obscure the findings to the extent of limiting or entirely effacing a nystagmus. The use of convex lenses serves three purposes: first, convergence is entirely impossible; second, the observer is able to view the eyes from in front; and third, the eyes are now much magnified. A spontaneous nystagmus of any form on looking straight ahead is always pathologic. The patient is then told to look to the extreme right and the extreme left. With an unintelligent patient this test is accomplished more easily by placing him in the revolving chair and have him fix his eyes on some distant point. The chair is then turned, first to the left and then to the right. In this way we revolve the body, as it were, around the eyes. A certain amount of lateral nystagmus, when looking to the extreme right or extreme left, is physiologic. It is pathologic only when it is of considerable amplitude or when there is a sharp difference between the nystagmus on looking to the right and on looking to the left. All forms of nystagmus become more pronounced when the individual attempts to look in the direction of the nystagmus. It is for this reason that the subject is made to look in various directions, as by so doing we are often able to bring out a pathologic nystagmus

of an amplitude not large enough to become evident on looking straight ahead. Nystagmus is recorded by means of an arrow—a straight one for horizontal nystagmus, and a curved one for the rotary; it seems simpler, as suggested to us by George Mackenzie, to have the arrow point in the direction in which the examiner sees the nystagmus on the patient. With eyelids held wide apart, the patient is told to look directly upward and then downward, with a view of discovering a vertical nystagmus, if present. This is of the utmost importance for the reason that, as Bárány has pointed out, a spontaneous vertical nystagmus is invariably intracranial in origin; furthermore, in our experience a spontaneous vertical nystagmus has proven itself to be a pathognomonic symptom of involvement of the brain stem either by pressure or infiltration. If a vertical nystagmus is present it is recorded—the arrow pointing either up or down, as the case may be. Paresis or paralysis of any of the ocular muscles, as well as the ability to perform conjugate movements of both eyes, are noted.

SPONTANEOUS VERTIGO.

The patient is asked not merely whether he is "dizzy," but whether he has any sensation of turning. If the latter is present, careful inquiry is made whether or not the turning is systematized. By systematized vertigo is meant:

1. The patient feels he is going in a certain direction.
2. The outside world is moving in a certain direction around him, but he himself is remaining still.
3. He himself is moving in one direction, and the world about him is moving in the opposite direction.

SPONTANEOUS POINTING.

(Figure 2.)

The patient sits in the chair and is told to put his arm forward and point with his forefinger. The examiner holds out his own forefinger, and allows that of the patient to come in contact with his. The examiner steadies his arm against his own body and further steadies his outstretched forefinger by means of the other hand. The patient's forefinger is allowed to come in contact with the examiner's finger, after which the

patient raises his arm, without bending the elbow, to the perpendicular position, and immediately brings it back to touch the examiner's finger. He is then directed to repeat this with his eyes closed. Should the patient find the finger, it is recorded under the column for pointing for the appropriate arm with a letter "T" (touched). Should he deviate either to the right or the left, the test is repeated a number of times to make sure that the failure is not the result of pure inattention, but that the deviation is constant and persistent in a certain direction. The distance of the deviation is recorded in inches, either to the right, or to the left, as the case may be, by noting under the appropriate pointing column—let us say "2 to R.," if the deviation happens to be two inches to the right, or "2 to L.," if the deviation happens to be to the left, etc. Should the patient fail to find the finger and "past-point" either to the right or to the left, his arm must never be pulled over towards the examiner's finger, if the test is to be repeated, because if this is done the patient finds out that he "past-pointed," and might make a conscious correction to overcome an actual tendency to "past-point." Instead, the examiner should again place his own finger under that of the patient. In taking the pointing, it is usually sufficient to test the pointing of the shoulder joint "from above," as described; the other forms of pointing, such as "shoulder from below," or "shoulder from the side," or pointing of the hips, are not performed routinely—these are undertaken only in cases where such extensive examinations appear to be necessary.

SPONTANEOUS FALLING.

The Romberg Test.—The patient is told to stand with heels and toes together and eyes closed. His station is noted. While in this position the head is quickly turned to the right, and observation made whether that had any effect upon the "station," or upon the direction of the patient's "falling," should he have any. The same observation is made after the head is quickly turned to the left. This test is of value in that patients with intracranial lesions always fall in the same direction, regardless of the position of the head, whereas a labyrinthine lesion causes falling in the direction of the affected ear.

"The Attempt to Overthrow."—This is Bárány's own "pelvic girdle test." The individual stands as before, with eyes closed, heels and toes together. The examiner grasps the patient at both shoulders, and attempts to overthrow him either to the right or the left, forward or backward, instructing the patient all the while to resist this attempt at overthrowing by a balancing movement at the hips. When the shoulders of the patient are moved towards the right, the pelvis should sway toward the left in an attempt to maintain equilibrium. On pushing the patient backward, the pelvis should move forwards, and so on. In this way the degree of freedom of pelvic movement is observed. A normal individual balances perfectly, and can lean in any of the four directions considerably before falling, whereas in one with an affection of the vermis of the cerebellum, the pelvis fails to compensate, and the patient falls over like a broomstick at the slightest touch.

Goniometer.—This consists of a movable platform so arranged that it can be tilted out of the horizontal plane. One end of the platform has a cord attached to it by means of which that end can be pulled down—the other end rising against a graduated perpendicular column. The patient stands in the center of this platform, either facing the examiner or at right angles to him. He is first tested with eyes open. One end of the platform is gradually lowered by pulling on the cord until the patient begins to sway, showing that he is about to lose his equilibrium. The other (perpendicular and graduated) end shows the number of degrees of tilting that were necessary before the patient began to lose his equilibrium. He is then tested in the same way with eyes closed. By means of the goniometer it is sometimes possible to bring out a latent tendency to fall not demonstrable in any other way. This is only occasionally useful.

Having completed the examinations for the various spontaneous phenomena, we are now ready to examine the vestibular apparatus by means of the turning and caloric tests. In order to carry out a good technic, it is well to bear in mind the whys and wherefores of the various tests. Both the turning and caloric tests depend upon the setting in motion of the lymph within the labyrinth. This circulation of the lymph stimulates the hair cells in the ampullæ of the semicircular

canals, starting impulses which are transmitted by nerve paths to the corresponding centers in the brain. The principle underlying these tests is that a known stimulus applied to a normal labyrinth will produce definite phenomena if the nerve paths from such a normal labyrinth to their centers are all intact.

Before drawing conclusions, therefore, we must be certain of our technic—we must make sure that the proper stimulus was applied, and must forever bear in mind the particular nerve path we are employing in a given test. The following points should be remembered:

1. The desirability of testing only one set of canals at a time.
2. In the turning chair we test only those canals which are in the horizontal plane, or rather those out of the absolutely vertical plane.
3. The caloric test affects only those canals which are in the vertical plane, or rather those which are out of the horizontal plane.
4. Each canal, when stimulated, produces a nystagmus and a vertigo in its own plane.
5. The eyes are always drawn in the direction of the endolymph movement (this is the slow component).
6. The vertigo is always in the direction opposite to the endolymph movement.

The individual is placed in a smoothly revolving chair which has an adjustable head piece, so that the head can be comfortably fixed and held in any desired position. The chair must also have a mechanism whereby it can be instantly stopped by means of a foot pedal in a given position and rigidly held there. Without such an arrangement past-pointing tests cannot be made accurately. Bárány constructed a special chair for this purpose, and we were fortunate enough to receive one of these chairs only a few days before the outbreak of the war in Europe. (Figure 3.) As it was hardly probable that any more of these chairs could come out of Vienna for some time, several physicians interested in the work asked us to design a chair along similar lines. After we had used the Bárány chair for several months, the following changes suggested themselves and were incorporated in the new chair (Figure 4):

1. The back of the chair and the head rest are so constructed that the patient's head is placed immediately over the axis of turning. This is obviously of great importance. In the original Bárány chair the head revolves away from the center of turning, and describes a circle with a diameter of over a foot.

2. It is impossible in the Bárány chair to hold the head in a forward position. We therefore constructed an extra head piece to permit rotation with the head inclined forward. It is obvious that it is absolutely essential for the head to be held steady when being rotated in this position, and this cannot be accomplished without a special head bracket.

3. Instead of having a special handle for turning, as in the Bárány chair, the rod at the back of the chair is made slightly longer and a handle placed at the top. The extra handle was very annoying and interfered with the pointing tests of the right arm by its presence on the side of the chair.

4. The base is made much heavier than in the Bárány chair, in order that the patient may be rotated rapidly, if necessary, and yet not have the chair wobble; this gives both the patient and the doctor a greater sense of security.

5. The Bárány chair is bound together by a great many bolts. In order to take the chair apart, in case it is desired to move it, all these bolts must be undone. In the new chair there are no bolts and the parts are all welded; the chair consists of only two pieces—the seat and the base. This makes it more portable, and is a great convenience when a patient has to be examined at a place where no such chair can be had. In constructing this chair we also aimed to make it suitable for use as a regular office treatment and operating chair, so that it would not require any extra room in the office.

TURNING.

The routine method is to test first for nystagmus, then for vertigo, and then for past-pointing. The horizontal canals are tested in the turning chair. To accomplish this the head must be secured in the head rest, tilted thirty degrees forward—the reason being that with the head perfectly erect, the external or so-called horizontal semicircular canal slants thirty degrees backward. If this precaution is neglected, the vertical canals also enter into the reactions.

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NYSTAGMUS AFTER TURNING.

During the turning the patient's eyes are closed. The chair is rotated to the right ten times, at the speed of two seconds to each turn, making twenty seconds for the ten turns, after which it is stopped. The patient is told to open his eyes and look off at a distance. The "after-turning" nystagmus is then noted, including its direction, character, and duration. The time of the nystagmus is best taken with a stop watch, the watch being clicked and time counted from the moment the chair is stopped until the very last nystagmus twitch disappears, when it is clicked again and the number of seconds read off. It is recorded with a horizontal arrow pointing in the proper direction after the words "To Right" on the chart. The amplitude is recorded in terms of either "large," "small," "fair," or "barely a twitch." The duration is recorded in seconds as read off from the watch. In a normal case this nystagmus should be twenty-six seconds.

In a similar manner the patient is turned to the left.

The employment of the stop pedal is not necessary in testing for nystagmus.

VERTIGO AFTER TURNING.

Vertigo after turning may be tested quantitatively. The plane of the induced vertigo is always in the plane of the canal stimulated and in a direction opposite to the endolymph movement. If it is the horizontal canals we wish to test, the patient's head must be fixed with the chin tilted thirty degrees forward. He is then turned, with eyes closed, to the right at a uniform speed, and is asked to keep on telling the examiner in what direction he is being turned. Thus he keeps on saying "to the right, to the right." After ten turns in ten seconds the chair is stopped and immediately he will say, "I am going to the left." The stop watch is started the same instant and kept running as long as the patient thinks he is going to the left. When he says, "I am standing still," the watch is stopped and the reading of the duration of the vertigo taken in seconds. In a normal case the duration of the vertigo is approximately twenty-four seconds.

The test is performed in a similar way by turning the patient to the left.

This quantitative test for vertigo is not necessary as a routine procedure. "Past-pointing," which we are about to discuss and which is routinely tested, makes this unnecessary. When the patient is turned to the right and stopped, he feels that he is turning to the left, and for this reason he "past-points" to the right. That is, when the patient is stopped after being turned in the chair, he has a subjective sensation of turning in a direction opposite to that in which he was actually turned. After touching the examiner's finger at this time, he is under the impression as he is raising his arm that he is turning away from the finger, and therefore tries to correct for that by moving the arm out to the point where he conceives the finger now to be. Since as a matter of fact he is not moving, the chair being held rigidly still, he points widely past the finger and continues doing so in lessening degree as long as the vertigo lasts. The very presence, therefore, of past-pointing is indicative of the presence of vertigo—the past-pointing being the objective evidence of his subjective impression of turning.

PAST-POINTING AFTER TURNING.

The patient's head is again fixed so that the horizontal canals only are tested, and the chair turned at double the speed of that for nystagmus—that is, the ten turns are made in ten seconds instead of twenty. The patient is carefully instructed as to what is expected of him, and is told to keep his eyes closed throughout the entire test. The examiner stands in front of the patient with the stop pedal near his right foot. As the chair is turned for the tenth time the pedal is released by the examiner's right foot and the speed of the chair gradually slackened, so that the stop is accomplished without any jarring. The patient's right hand is then quickly grasped, and after his forefinger touches the examiner's finger, the examiner says "up," upon which the patient raises the arm in question to the perpendicular and immediately tries to come back to the examiner's finger. The "past-pointing" is called off in inches and recorded by the assistant where it says "shoulder from above," as, for instance, "15 to R." (fifteen inches to the right). The left arm is immediately tested in the same way, then the right arm again, then the left arm

again, and so on until there is no longer any past-pointing. In a normal case the vertigo lasts sufficiently long to permit of three past-pointings of each arm, gradually lessening in extent until the patient is again able to find the finger.

The patient is then turned to the left and the past-pointing of both arms taken and recorded as above.

The patient's eyes must be kept closed throughout these tests, and if his cooperation is doubtful, it is best to blindfold him.

The turning tests affect only those semicircular canals which are in a horizontal plane while the patient is turned. Should it be desired to test the two sets of vertical canals by turning, the patient's head must be placed either one hundred and twenty degrees forward or sixty degrees backward. For turning with the head forward, a small bar with a comfortable head rest is placed between the two arms of the turning chair, as shown in Figure 4, and the patient turned ten times, first to the right. The resulting nystagmus and vertigo are of course in the frontal plane—a rotary nystagmus to the left and vertigo to the left.

In taking the past-pointing the patient keeps his head in the same position after stopping the chair, and the examiner is forced to kneel on the floor in making the test. The past-pointing is not so large as that obtained from the horizontal canals, but is with both arms to the right after turning to the right, and with both arms to the left after turning to the left.

When testing the vertical canals with the head back, the upright, or turning, handle is loosened at the ratchet and turned back. The head rest is brought all the way down and the head comfortably fixed in a position sixty degrees backward. The patient is turned to the right, and there is produced a rotary nystagmus to the right (just the opposite to that obtained from turning with the head forward). The past-pointing, however, is also to the right, just the same as that obtained after turning to the right with the head upright or with the head forward. It may be remarked in passing that this test does not bear out the statement and law laid down in all the writings on this subject, including Bárány's, that "the past-pointing is always in the direction opposite to that of the nystagmus." Nystagmus and vertigo (with its consequent past-

pointing) are not in any way dependent on each other. They are different reactions produced by stimuli sent along entirely different paths. A normal individual always past-points to the right after having turned to the right, regardless of the position of the head. Nystagmus, on the other hand, is in a diametrically opposite direction, after turning with the head backward from what it is on turning with the head forward. Turning to the right with the head back produces a nystagmus to the right and a past-pointing to the right, so that the statement that "past-pointing in a direction opposite to the nystagmus" is not only misleading and confusing, but actually incorrect.

FALLING AFTER TURNING.

This results when the individual tested has a subjective sensation of turning in a vertical plane. He will fall to the right or left if he thinks he is turning in a frontal plane, and will fall forward or backward if he thinks he is turning in a sagittal plane. Therefore, turning a patient with the head tilted thirty degrees forward produces no falling, as the patient feels he is revolving in a plane parallel to the floor. Similarly, turning with the head forward or backward produces no falling so long as the head is maintained in this position. If, however, after turning with the head forward or backward, the head is brought to the upright position, the subjective sensation is now one of turning in a plane at right angles to the floor, and the patient falls either to the right or left. Again, if the head is inclined toward the shoulder, after the turning the subjective sensation is one of turning in a plane parallel to the floor; if the head be raised to the upright position, however, the subjective sensation is that of turning in a sagittal plane, and the patient falls forward or backward. These tests, however, are seldom necessary in routine examination.

CALORIC TEST.

The main advantage of the caloric test of Bárány is that it enables us to examine each internal ear separately, and also to analyze the function of its canals separately, whereas turning stimulates both labyrinths at the same time. It is essential to have an absolute standard in the matter of temperature of the water. As Bárány directs, we employ water at 68° F.

This temperature is sufficiently cool to secure a good reaction, and yet not cold enough to be uncomfortable to the patient. When hot water is to be used the temperature is 112° F. The latter should be but seldom used.

The vessel containing the water is placed about two feet above the level of the ear to be douched. The shape or size of the nozzle is immaterial, the essential thing being that a free and continuous stream of water shall flow against the drum membrane maintaining an even temperature of sixty-eight degrees. The nozzle shown in Figure 5 is very convenient, as it has a closing valve within easy reach of the fingers. This valve also enables the examiner to regulate the force and volume of the stream of water entering the canal. Figure 6 shows a rubber receptacle placed underneath the patient's ear to catch the return flow of the water. A tube at the bottom conducts the water into a basin below. When this is properly attached there is little chance of wetting the patient, and if necessary douching can be kept up for several minutes without any interruption.

Remembering the desirability of testing only one set of canals at a time, and recalling still further that this caloric test influences only those canals which are in a vertical plane, the patient's head is placed thirty degrees forward so as not to include the horizontal canal in the reaction. The chair is held firmly by the foot clamp, the stop watch is held ready, the nozzle is inserted into the canal, and the instant at which douching is started the stop watch is clicked. The patient's eyelid is elevated; the patient is asked to look down and the eyeball carefully watched for any rhythmic nystagmus to appear. The moment that a rotary rhythmic nystagmus appears the stop watch is clicked again and the number of seconds necessary to produce the reaction noted. We usually continue the douching for a few seconds longer in order to obtain the maximum reaction. In the normal, nystagmus appears after forty seconds, and after douching for five or ten seconds more shows a large amplitude. The direction of the nystagmus is recorded by a curved arrow on the chart where it says "douche right." The amplitude is noted beneath and then the length of time required to produce it.

The patient is then told to close his eyes and the pointing

tests are carried out and recorded in the same way as before described. It is well to remember that this douching has produced vertigo in the frontal plane—the same reaction that occurs after turning with the head forward; the patient, therefore, exhibits a marked tendency to fall, and it is advisable to have an assistant hold the patient's head firmly in the head rest while taking the pointing tests. As soon as the past-pointing of the arms has been taken, the head is quickly tilted to a position sixty degrees back, which places the horizontal canal in the vertical plane in a position in which it can be affected by the chilling. The patient is told to look upward, and the existing rotary nystagmus immediately becomes horizontal. The pointing of both arms is then quickly taken with the head in that position. The head may then be tilted forward ninety degrees and the past-pointing of both arms be taken again. This new position of the head again influences the horizontal canal, but has reversed the direction of the endolymph movement. All the reactions, therefore, are also reversed. The duration of the average stimulus after douching is long enough to permit of the examination of the head in the three positions just given. It is well to note that in this way one douching of only one ear can test out all the pathways for nystagmus as well as produce past-pointing in all directions, enabling us to test out the integrity of the entire cerebellum.

Falling.—The caloric test by its very nature produces vertigo only in a plane at right angles to the floor, so that "falling" always occurs on douching a normal ear. All that is routinely necessary is to observe the tendency to fall, while the other examinations are going on, and to note it on the chart.

ELECTRICAL.

For practical purposes the electrical tests have been of only slight use in our experience. Since the ability to examine one set of canals at a time is of such prime importance in making these tests of great clinical usefulness, it is evident how limited are the uses of an agency which stimulates at the same time not only the entire labyrinth, but the eighth nerve as well, and perhaps even the medullary nuclei. It is of great use, however, when the question arises as to a differential

diagnosis between a destruction of the labyrinth and the eighth nerve. In a recent destruction of the labyrinth the caloric test will produce no reactions. The electric current, however, may directly affect the eighth nerve and produce normal reactions. When the galvanic current is used a large electrode is held in one hand, and a small one is placed on the mastoid process. Both electrodes should be covered with cloth or cotton fairly saturated with a normal salt solution. The current is gradually turned on, and when four milliamperes are discharged a nystagmus should appear.

It must not be thought that a routine examination of the internal ear requires all the preceding tests. In order to illustrate the simplicity of a complete average examination of the static labyrinth we insert a chart properly filled in with the results of the examination of a normal individual (Figure 7). Naturally, for example, if douching the vertical canals of both ears gives a doubtful response, it is wise to verify the examination by turning with the head back—or forward; in this case the findings are recorded on an extra chart to avoid confusion. In the average case, however, it is necessary merely to fill out one vestibular page, as shown, and to conduct all the tests with the head upright; the turning in this position tests the horizontal canals, and the douching examines the vertical canals. The examiner needs merely to complete this chart to have before him all the essential data of a routine examination.

Name _____ Date _____
 Address _____
 Referred by _____ Age _____

DIAGNOSIS

SUMMARY

Complaints of

HISTORY

Dizziness
 Staggering
 Deafness
 Tinnitus

NOSE

THROAT

A. D.

EARS

A. S.

Fistula

Hearing Tests						
A	A	c	Ac	Bc =	n	Galt
			Ac	Bc =	n	Pcl.

FIGURE 1.

TESTS OF THE VESTIBULAR APPARATUS

		SPONTANEOUS		POINTING	
NYSTAGMUS				RIGHT	LEFT
Looking to RIGHT		Shoulder from above " " below " " side			
Looking to LEFT		Nystagmus Vertigo Past-pointing Falling			
Looking UP		Romberg Turning head to right Turning head to left Attempt to overthrow Goniometer			
Looking DOWN					
		TURNING			
To RIGHT		To RIGHT Shoulder from above		to	to
Amp.					
Duration	Sec.	Nystagmus Vertigo Past-pointing Falling			
To LEFT		To LEFT Shoulder from above		to	to
Amp.					
Duration		Nystagmus Vertigo Past-pointing Falling			
		GALORIC			
Douche RIGHT		Douche RIGHT Shoulder from above		to	to
Amp.					
After min	sec	Nystagmus Vertigo Past-Pointing Falling			
Head Back				to	to
Amp.					
Douche LEFT		Douche LEFT Shoulder from above		to	to
Amp.					
After min	sec	Nystagmus Vertigo Past-pointing Falling			
Head Back				to	to
Amp.					

FIGURE 1.



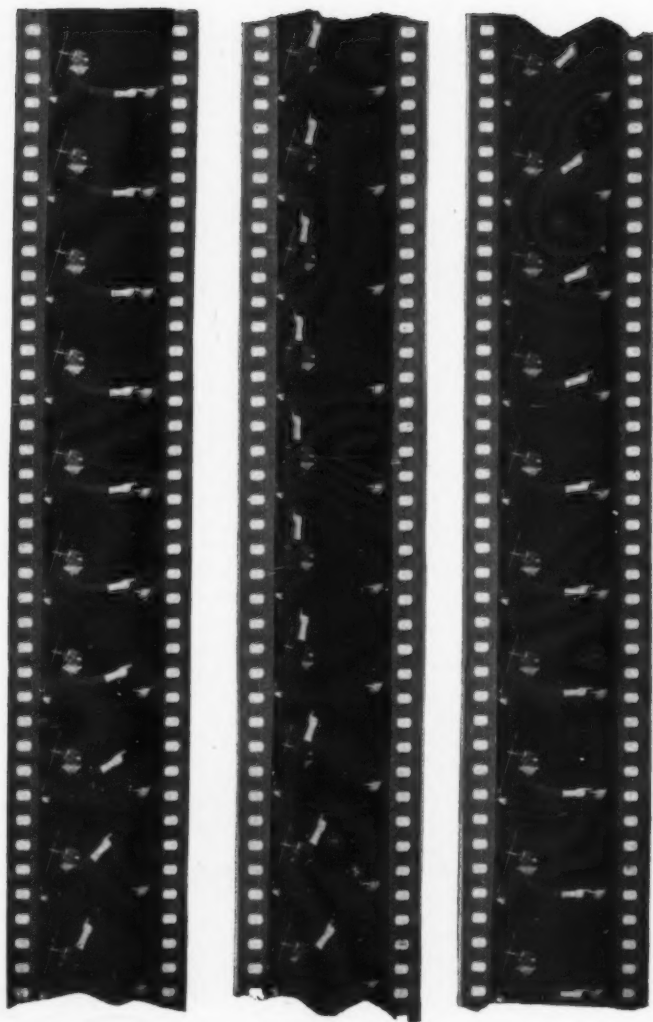


FIGURE 2.





FIGURE 3.
The Bárány Chair.

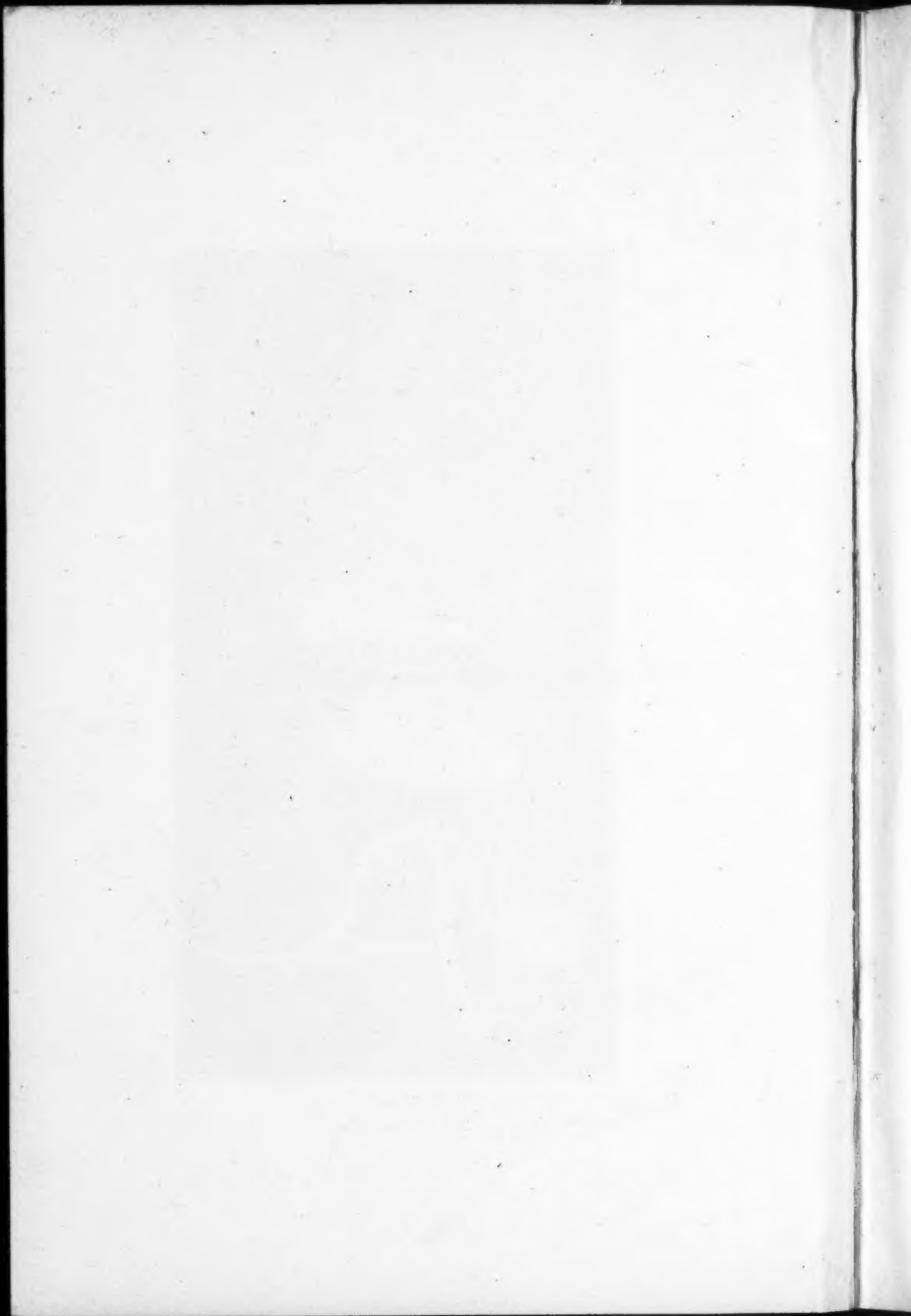




FIGURE 4.
American Modification of the Bárány Chair.

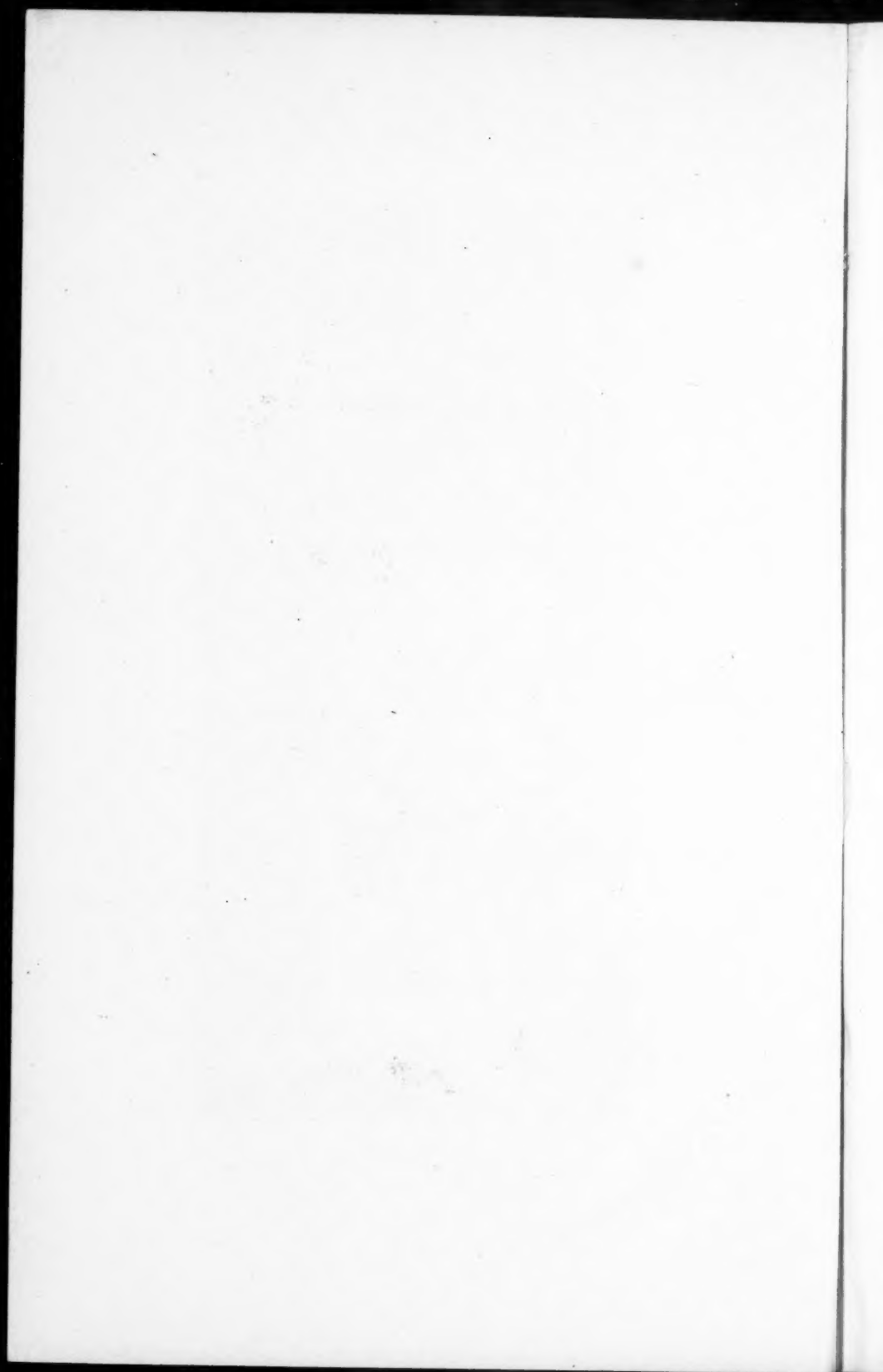




FIGURE 5.
Nozzle with closing valve.



FIGURE 6.
Rubber receptacle to catch return flow of water.

TESTS OF THE VESTIBULAR APPARATUS

SPONTANEOUS		POINTING	
NYSTAGMUS		RIGHT	LEFT
Looking to RIGHT <i>Slight normal</i>	Shoulder from above " " below " " side	T T T	T T T
Looking to LEFT <i>Slight normal</i>	Nystagmus <i>none</i> Vertigo <i>none</i> Past-pointing <i>none</i>		
Looking UP <i>None</i>	Falling <i>None</i> Romberg <i>Negative</i> Turning head to right <i>Negative</i> Turning head to left <i>Negative</i>		
Looking DOWN <i>None</i>	Attempt to overthrow <i>Normal, pelvic movements</i> Goniometer <i>Normal</i>		
TURNING			
To RIGHT → Amp. <i>good</i> Duration <i>4 Sec.</i>	To RIGHT Shoulder from above Nystagmus <i>Normal</i> Vertigo <i>Normal</i> Past-pointing <i>Normal</i> Falling <i>None</i>	12 to R	10 to R
To LEFT ← Amp. <i>good</i> Duration <i>2.4</i>	To LEFT Shoulder from above Nystagmus <i>Normal</i> Vertigo <i>Normal</i> Past-pointing <i>Normal</i> Falling <i>none</i>	10 to L	12 to L
CALORIC			
Donche RIGHT → Amp. <i>good</i> After <i>min 4 sec</i>	Donche RIGHT Shoulder from above Nystagmus <i>Normal</i> Vertigo <i>Normal</i> Past-Pointing <i>Normal</i> Falling <i>Normal</i>	8 to R	6 to R
Head Back → Amp. <i>good</i>		10 to R	8 to R
Donche LEFT ← Amp. <i>good</i> After <i>min 4 sec</i>	Donche LEFT Shoulder from above Nystagmus <i>Normal</i> Vertigo <i>Normal</i> Past-pointing <i>Normal</i> Falling <i>Normal</i>	6 to L	8 to L
Head Back ← Amp. <i>good</i>		8 to L	10 to L

FIGURE 7.

II.

AN ANALYTIC STUDY OF THE RINNE AND OTHER TUNING FORK TESTS.*

FIRST COMMUNICATION CONCERNING PERCEPTION DEAFNESS.

BY JESSE WRIGHT DOWNEY, JR., M. D.,

BALTIMORE.

I.

In a paper published in 1855, Rinné¹ claimed that a vibrating tuning fork is stronger and longer heard by bone conduction than by air conduction in diseases of the middle ear, and vice versa in diseases of the perception apparatus. The test did not come into general use until 1887, when Lucae² called attention to its great importance and elaborated many rules to govern its application, as likewise did Bezold.³ An interesting résumé of the earlier controversies concerning the test was given by Turnbull and Reed⁴ in 1888. From then to date contributions to the literature of the subject have been numerous.

It would be hardly possible to doubt the diagnostic value of the Rinné experiment in testing hearing, and yet there is no statement so misleading as the average textbook instructions concerning the method of comparing bone and air conduction. Nine out of ten authors describe the test as being made by holding the tuning fork over the mastoid until the patient says it is no longer heard, when it is then quickly transferred to the front of the auricle, and if the patient says that it is again heard, the test is positive, and the lesion, if one exists, is probably in the sound perceiving apparatus; if the tuning fork is not heard by air conduction, the Rinné is negative, and

*Read before the Section on Ophthalmology and Otology of the Baltimore City Medical Society, October 18, 1916.

the deafness is conductive in character. The method of making the test may also be reversed.

By the Rinné experiment we should attempt to determine:

- (1) Whether or not air conduction is normal.
- (2) Whether or not bone conduction is normal.
- (3) In which course of sound conveyance lies the defect, or the greater defect, in hearing.

Under the first proposition we test all those structures which have to do with the conveyance of sonorous vibrations until they are perceived as sound. Under the second proposition we test those intralabyrinthine structures which have to do with the conversion of the mechanical vibrations into a nerve stimulus and the conveyance of this stimulus to the higher centers. The Rinné test should be made, therefore, as recommended by the Eighth International Otological Congress (Budapest, 1909), by a separate test of air and bone conduction, and the result recorded accordingly.

II.

In the first analysis we must consider sound with all its phenomena in terms of physical vibrations which would exist as a part of kinematics or mechanics, even if we did not have the sense of hearing. The ears convey and properly transpose, but they do not create, the vibrations which the brain recognizes as sound; therefore, to a large extent, hearing is governed by physical and anatomic properties rather than by physiologic or psychologic hypotheses. The vibrations set up in the air by any sonorous impulse—for example, a tuning fork—are taken up by the drum membrane as vibrations, and are conducted by the ossicular chain to be transmitted by the footplate of the stapes to the perilymph of the scala vestibuli; these vibrations continue around the helicotrema into the scala tympani to impinge, if there be sufficient force, against the membrane closing the foramen rotunda. During the course of the vibrations through the perilymph of the scala vestibuli they are transferred to the endolymph of the ductus cochlearis, probably by the law of physical resonance stimulating into vibration certain analytic areas in the membrana tectoria. As the result of the interaction between the membrana tectoria and the hair cells of the organ of Corti the vibrations are con-

verted into a nerve stimulus, and this is transmitted by the cochlea branch of the eighth nerve to the cerebral centers in the temporosphenoidal lobes of the brain, and recognized, in the case of our example, as the sound of a tuning fork.*

From the foregoing it must be obvious that up to the point where the vibrations are converted into a nerve stimulus, hearing must be governed by the same laws governing physical vibrations. Elementary physics teaches that the pitch of a sound is due to the number of vibrations to the second set up by the initial shock, and that it is constant as long as the sound can be perceived; the intensity, or loudness, however, depends on the amplitude of the vibrations, and decreases from second to second until the oscillations are too small to be taken up and conveyed by the conduction apparatus, and then our perception of sound ceases. The conduction apparatus of the normal ear can convey sonorous shocks as slow as sixteen double vibrations to the second, and as rapid as thirty thousand or more, if the intensity is sufficient. All vibrations within this range are capable of setting up resonance in the tectorial membrane, to be taken up by the interacting hair cells of the organ of Corti and converted into a nerve stimulus and recognized as sound. Hence, hearing may be said to be measurable by the ability of the conductive apparatus to transmit and the nervous apparatus to perceive vibrations of any rapidity within the normal range under what is estimated to be a minimum intensity as compared to the normal minimum intensity. Therefore, it is not sufficient to determine that a tuning fork is "heard," for such a determination may only mask a degree of deafness which may be of diagnostic importance; likewise, the fact that a tuning fork is "not heard" may only mean that we are below that intensity necessary to set a defective conduction apparatus into vibration, or to stimulate a diseased nerve ending, or even to create a

*Without entering into the mechanical action of the ossicles, this is the simplest physiologic explanation of the conveyance, the reception and the perception of sound vibration. It is the Helmholtz theory augmented by the investigations of Shambaugh,⁵ who has anatomically demonstrated the impossibility of the basilar membrane being the vibrating structure, whereas the tectorial membrane apparently can and does fulfill this rôle. This theory is much more logical than the speculative "telephone theory" of Rutherford, and it will be dogmatically accepted throughout this paper.

nerve impulse powerful enough to "get through" a true "nerve block."

III.

With a tuning fork we have a means of obtaining a musical tone of constant pitch with a prolonged intensity which decreases in definite retrogression until its vibrations can no longer be conveyed or perceived as sound. It is necessary that we make the attempt to determine the intensity under which a fork is heard, and, with all its faulty factors, our best index of this is the difference between the faulty duration of perception and the normal duration of perception; for it is the only practical way that we have of determining the vibrations of the smallest amplitude capable of setting up similar vibrations which can be conveyed and perceived as sound. Unfortunately, the decrement of the vibrations of a tuning fork is not uniform from second to second, but is much more rapid at the beginning than near the end, for the reason that the amplitude decreases by geometric progression; that is to say, the decrement in intensity from one step to the next takes place by a division of the initial and the succeeding amplitudes by a constant quantity. This constant quantity varies with each and every tuning fork, and otology is greatly indebted to Dundas Grant⁶ for the methods and formulæ necessary to determine it. Though the problems involved almost prohibit the scientific estimation in everyday work of the actual percentage value of the hearing of the tuning forks, the law of decrement is unalterable, and the practical significance is as follows:

In all tests with all tuning forks the duration of the perception, both abnormal and normal, must be determined and noted, and the difference in time between defective and normal perception of the duration of the vibrations, and not the duration of perception itself, taken as the factor of importance and the one which must serve as the index of defective audition. (See Figures 1 and 2.)

The normal duration of perception will vary greatly, as it is practically impossible to obtain a standard initial intensity with the various forks, or even with the same fork at different times, though many methods have been tried, notably by Gradenigo,⁷ whose investigations should be carefully studied,

but the abnormal hearing will also vary in approximately the same proportion.*

IV.

Hearing by air conduction is physiologic, the mechanical perfection of the ossicular chain making it possible for us to interpret vibrations of very low intensity. Up to the point where the vibrations are transferred by resonance to the tectorial membrane, hearing is purely a question of sound wave conduction; beyond this point hearing becomes truly perceptive in character. In diagnosis it is important that we be able to locate the situation of a lesion causing deafness, and this becomes possible because a vibrating tuning fork placed upon any portion of the cranium can be perceived without the waves being conducted through the ossicular portion of the conduction apparatus.†

The normal duration of perception for a tuning fork by bone conduction is much less than the normal duration of perception by air conduction.‡ It seems to be generally assumed that this is so for the reason that sound vibrations are not transmitted as well through a solid as through the air. Without qualification, this is a makeshift and unscientific explanation, for sound vibrations are imparted to and conducted for some distance through solids without appreciable loss in the intensity. How then may an inch of porous bone, form-

*In *The Laryngoscope* for September, 1914, I published the description of "An Apparatus Designed to Give an Approximately Accurate Quantitative Hearing Test." The instrument was constructed with the purpose of obtaining a tuning fork stimulation of uniform value, and hence a sound of constant intensity. The apparatus is more or less of a failure in this respect, but after hundreds of trials I have found that the proportion between abnormal and normal hearing is strikingly preserved, though the duration of perception may vary considerable.

†Bezold and Henson claimed that the oscillations were first taken up by the tympanic membrane and ossicles, and that bone conduction was due to what was termed cranio-ossicular transmission. That this theory is erroneous is proved by the fact that bone conduction is increased, if altered at all, after the mastoidotympanic exenteration.

‡Eitelberg* showed that the normal duration of perception for the C₂ (512 d. v. s.) tuning fork on the various parts of the cranium was as follows: Mastoid, 30 seconds; forehead, 18 seconds; occiput, 20 seconds; teeth, 15 seconds. The normal duration of the same fork by air conduction being 58 seconds.

ing almost a tubular conductor, reduce the normal hearing by bone conduction to a minimum percentage value of the same sound conducted through the medium of the drum head and the ossicles?

A tuning fork placed on any part of the cranium imparts its vibrations to the bone, and these vibrations are distributed to all parts of the head. Why then may we not consider hearing by bone conduction as simply the result of "sympathetic vibration," especially since Shambaugh's investigations have anatomically enhanced the Helmholtz theory of hearing? We know that we can create vibrations in a stable tuning fork by bringing a vibrating one of its own pitch in proximity or by touching a stand on which the quiet fork rests with vibrating fork. These induced vibrations will be of less intensity than those of the exciting force and, consequently, shortened in duration or perception, for there is a leakage of energy through friction or wave emission, so that the forced vibrations only increase up to the point at which leakage of energy balances the energy put in by the applied force; therefore, in resonance there is always a loss of energy, and the amplitude only increases until the loss is balanced by the gain from the work done by the applied force. If there were no dissipation of energy, the vibrations would increase indefinitely when the periods coincided. Why then may we not postulate the following explanation of bone conduction?

With a vibrating tuning fork held on the mastoid, or on any part of the cranium, we hear its vibrations through the creation of "sympathetic vibration" in that area of the tectorial membrane tuned to respond to the pitch of the fork used. The sound is reduced in intensity, and, therefore, in duration of perception because the tectorial membrane can only vibrate up to a point where the leakage of energy balances the energy put in by the fork on the mastoid.

SUMMARY.

The whole matter may be summarized as follows:

1. By both air and bone conduction it is necessary that we have some index which will indicate the intensity under which a tuning fork is heard, and the simplest way to obtain a factor of this description is by comparing the abnormal duration of

perception with the normal duration of perception and taking the difference between the two as the significant indicator.

2. As the energy necessary to make a tuning fork heard by bone conduction is markedly greater than the energy necessary by air conduction, the normal duration of perception of each is different; therefore, we may not directly compare the one with the other, but we must make separate tests of each course of sound conveyance.

V.

The tuning fork tests being wholly and purely subjective, we have been led to doubt, not only the results of others, but our own findings as well, and for this reason so many qualifications and exceptions have crept into acceptance that each individual seems to have a system of his own, and the original tests are almost worse than useless. If we can bring ourselves to postulate dogmatically one rule, and working from that prove or disprove the whole, our results will assume a different aspect. Accepting resonance as the chief factor governing bone conduction, I consider that a shortening of ten seconds or more by bone conduction is abnormal, especially if it is unilateral, the other ear being normal, and if contraauidition has been prevented by the use of the "noise apparatus."

The older investigators were hampered and confused by the impossibility of excluding one ear while the other was being tested, as the occurrence of contraauidition, the bone conduction from the mastoid of one ear to the opposite ear, prevented a true determination of the duration of perception by bone conduction, and this was the reason so many restrictions were placed on the use of the Rinné test by such scientists as Hartman, Bezold, Lucae and others, and the discrediting of the Schwabach test. The introduction by Bárány of the noise apparatus has made it possible to diagnose total unilateral deafness, and, what is more important, to determine the duration of perception of the sound of a tuning fork by bone conduction in each ear separately. The use of the noise apparatus and the possibilities of original work along this line has not, to my mind, been sufficiently investigated. We are inclined to think that the instrument is only of value to exclude one ear in testing for total deafness. As a matter of fact it

should be used whenever bone conduction is tested, and there is no reason why we may not be able to test restricted areas of the tectorial membrane by the use of a scientifically constructed suppression apparatus.*

VI.

In the use of the tuning forks of different pitch it must be remembered that the amplitude of the forks of low pitch is wide, the time rate of decrement slow, and the intensity weak; therefore, a slightly defective conduction apparatus will fail to convey these vibrations when the normal ear will still transmit and perceive them for a long time afterwards. With the forks of high pitch the amplitude of the vibrations is short, the time rate of decrement very rapid, and the intensity very strong; hence, the difference between defective perception and the normal perception of the duration of the vibrations may be so short that it is immeasurable. (Figure 3.)

By the use of three tuning forks, the C (128 d. v. s.), the C² (512 d. v. s.), and the C³ (4096 d. v. s.), the useful range of hearing may be covered, and my routine examination is made in the following order and manner:

- (1) The Weber test.
- (2) The Schwabach test, the duration of the perception by bone conduction for the C² fork as compared to the normal. The noise apparatus tuned to cut out this fork is used to exclude the ear not being tested.
- (3) The duration of perception for the C² fork by air conduction as compared to the normal. (The method to be described later.)
- (4) The duration of perception for the C fork by air conduction as compared to the normal. (The method to be described later.)

*Francis R. White exhibited before the Ninth International Otolological Congress, Boston, 1912, a noise apparatus which is simple and inexpensive, and yet is the most useful and adaptable of all these instruments whose requirements he summed up as follows:

- "(1) The sound must effectually exclude all other sounds.
- "(2) The sound must not be transmitted to the other ear.
- "(3) The sound apparatus must be regulated for varied hearing.
- "(4) The use of the apparatus must not be disagreeable to the person being examined."

The White and the Neumann instrument fulfill all these requirements. The Bárány instrument cannot be regulated, and is disagreeably loud.

(5) The duration of perception for the C⁵ fork by air conduction as compared to the normal. The noise apparatus tuned to great intensity is used to exclude the ear not being tested.

All these trials are timed with a stop watch, and the result of each is written in the form of a fraction the numerator of which denotes the patient's hearing and the denominator my own hearing. If there is a difference in our hearing in any test it is noted minus or plus, and this is the important factor that indicates the defect in the patient's hearing.

The Weber test, when properly explained to the patient, is usually accurate; it may be verified with the noise apparatus, but when the fork is not heard from the forehead or the teeth it is indicative of perception deafness. The Schwabach test should be made in the original way, by transferring the fork from the patient's mastoid to one's own, or vice versa.* The normal perception duration of a tuning fork is much more constant and much easier for the patient to determine by bone conduction than by air conduction, and the noise apparatus increases the ability to say when the fork is no longer heard. In estimating the duration of perception by air conduction it is not always easy for the patient or the examiner to determine when the vibrations can no longer be perceived; this is probably due to interference with the sound waves, reflections, etc., unless the fork is held in exactly the right position in front of the auricle. To avoid these factors I make use of a small stethoscope (Figure 4) upon which I rest the handle of the tuning fork, one tube being in the patient's ear the other in my own. The method is good for any fork below the C³ (1024 d. v. s.), and has been advised in various forms by several aurists. For the routine bone conduction test the C² (512 d. v. s.) has proven the most valuable in my hands; it is heard and not felt, and it tests the central portion of the tectorial membrane. I look upon the tests with the various forks named

*Years ago Kayser used a tuning fork mounted in the middle of a wooden bar, one end of which was placed on the patient's mastoid, the other on his own. Bárány suggests the use of an otoscopic tube. I find by this method that the physician's duration of perception is less than normal and that the tube creates a Weber reaction in the patient's ear. Wanner proved that the electrically stimulated forks were unnecessary, and that the test could be made as accurately by the older method.

as giving me a "field of hearing" the variations of which furnish the basis of differential diagnosis.

The classification to be given presupposes that bone conduction when properly estimated is an infallible indication of the condition of the auditory nervous apparatus, that the C fork is the lowest in the key of C allowing an approximately accurate estimation of the intensity under which this note may be heard and not felt, and that the C⁵ fork should be heard, under its minimum intensity, in all cases of conductive deafness.

VII.

(A) Conduction deafness, including affections of the eustachian tube, when:

(1) The Weber reaction is referred to the ear complained of or said to be the deafer.

(2) The bone conduction for the C² fork is equal to or greater than the normal in duration of perception.

(3) The air conduction for the C² fork is reduced in duration of perception as compared to the normal. (Rinné showing all deafness to be by air conduction.)

(4) The air conduction for the C fork is reduced in duration of perception as compared to the normal, and to a greater degree than for the C² fork.

(5) The air conduction for the C³ fork is normal in duration of perception.

Case 1.—K. S. is a patient who has had the radical operation and retained good hearing, distinguishing the whisper at four and conversation at ten feet. Bone conduction for the C² fork + 5" (40"/35"). Her duration of perception for the tuning forks as compared to the normal shows that her hearing is purely a question of faulty conduction.

C—49" (16"/65")

C¹—27" (13"/40")

C²—30" (30"/60")

C³—10" (15"/25")

C⁴—3" (18"/21")

C⁵—1" (9"/10")

If this patient is accepted as a control case, and I feel justified in presenting her record as such, the record of her hearing

can be taken as a demonstration of the physical properties of audition which have heretofore been described. Theoretically this girl has a form of deafness which, if we had an instrument of absolute precision as to intensity, could be shown to be actually the same for all these forks. That is to say, that a reduction of forty-nine seconds for the C fork does not indicate any greater degree of deafness than a reduction of one second for the C⁵.

The case has been given to show that in pure conduction deafness the results of the tuning fork examination will follow the physical laws governing the same. There are exceptions, but these exceptions are often important, especially in the diagnosis of otosclerosis. If the bone conduction is increased, normal or slightly decreased (five to ten seconds) in duration of perception for the C² tuning fork, with a decrease by air conduction for the same fork which is equal to or greater than the decrease in the duration of perception for the C fork, one should be guarded in prognosis, for with a normal drum head, a patent eustachian tube, and the complaint of tinnitus, one is probably dealing with a beginning ankylosis of the footplate of the stapes. The explanation of this defect in hearing has puzzled me until the appearance in the *ANNALS OF OTOTOLOGY, RHINOLOGY AND LARYNGOLOGY* for December, 1915, of an article by G. M. McBean, of Chicago, entitled "Theories Concerning Paracusis Willisii," in which this pertinent inquiry is advanced: "Is there any longer a sound conduction apparatus when its most important link, namely, the fenestrostapedial articulation, has become ossified? The sound conduction has then ceased to exist as a specialized mechanism."

In making air conduction tests by means of the stethoscopic method, the sound waves are conducted directly against the drum head without interference; therefore, the vibrations from the C fork probably act in the same way as the jolting under which paracusis Willisii becomes a symptom. With the C² fork this element of jolting is by no means so marked, and we must actually hear these vibrations through the action of the ossicles. When the footplate of the stapes is free there remains a flexibility which prevents the sensation of vibration (pallesthesia), though the vibrations may not be transposed and transmitted as well. When ankylosis begins, the ossicular

chain takes on the characteristics of a solid connecting bar between the drum head and the cochlea, rather than a perfect conducting medium; therefore, the vibrations of the C fork are felt under the law of "deep sensibility," whereas the vibrations of the C² fork are not suited to reach the sensorium by this route, and we lose in duration of perception for the C² fork to a greater degree than for the C fork. As the ankylosis progresses the hearing tests take on the characteristics of a simple conduction deafness of marked degree.

Case 2.—Otosclerosis. Mrs. C., aged thirty-five years. Complains of deafness slow in onset but progressive in character. Drum heads and tubes normal.

Right.		Weber not referred.		Left.	
B.C.	-12" (20/30)	A.C.	-74" (15/89)	C ²	-54" (35/89)
		A.C.	-39" (15/54)	C	-36" (25/61)
		A.C. N.	(9/9)	C ²	N. (10/10)

Case 3.—Conduction deafness, right; labyrinthine deafness, left. Miss K. H., aged twenty-eight years. Complains of deafness in the right ear which has grown worse within a few weeks. Left ear deaf for years. History of many recurrent attacks of earache when a child.

Right.		Weber referred to right.		Left.	
B.C.	-5" (20/25)	A.C.	-28" (15/42)	C ²	(Neg. /50)
		A.C.	-45" (15/60)	C	(Neg. /55)
		A.C.	-1" (9/10)	C ²	(Neg. /10)

Ear drums: Right markedly retracted in anterior segment. Handle indrawn. Left retracted, but not so markedly as right; scarred. This patient had an acute eustachian catarrh in the right ear, which quickly responded to treatment. No attempt was made to treat the left ear.

If the "fields of hearing" are contrasted in these cases, it will be noted that although the deafness for the C fork is much greater in Case 3 than in Case 2, the deafness for the C² fork in Case 3 is also much less than in Case 2. In Case 2 the greater degree of deafness is for the C² fork. In Case 3 the deafness is more marked for the C fork. In Case 3 the left ear is, for all practical purposes, totally deaf. Made in the ordinary way, Rin   would have been called negative because contraudition was marked. With the noise apparatus it was a simple matter to determine the nervous element in the case.

VIII.

(B) Perception deafness may be considered complete when the field of hearing is as follows, assuming that the lesion is unilateral:

(1) The Weber reaction is referred to the better ear.

(2) The bone conduction for the C² fork is negative, the good ear being suppressed with the noise apparatus.

(3) The air conduction for the C² fork is negative, the good ear being suppressed with the noise apparatus, and the C² fork, stimulated to its greatest intensity, is not heard by the stethoscope method.

(4) The air conduction for the C² fork is negative under the conditions just described (3).

(5) The air conduction for the C⁵ fork is negative. With this fork it is particularly needful that the noise apparatus be used.

Robert Bing, in his most valuable "Compendium of Regional Diagnosis in Affections of the Brain and Spinal Cord" (second edition, page 134), has this to say: "Between nerve deafness—namely, that due to lesions of the cochlea nerve or its supranuclear tracts and that due to lesion of percipient structure in the cochlea—no symptomatologic distinctions can be drawn. From the neurologic point of view, therefore, the regional diagnosis of lesions of the auditory mechanism must be regarded as wanting in precision." As a matter of fact, the question of differentiation, though presenting problems of baffling complexity, is by no means beyond the realm of possibility. Gradenigo, to whom we owe so much along the line of acoumetry, has shown that it is possible, and Hollinger,⁹ among others, has reported most convincing cases.

Accepting the theory that tone analysis takes place in the labyrinth, and that the cochlea branch of the auditory nerve serves but to convey all tones to the higher centers, we may assume certain things:

Labyrinth—

(1) If the intralabyrinthine structures are completely involved, we will have total deafness, both by bone and air conduction.

(2) If the intralabyrinthine structures, excluding the nervous elements, are but partially involved, we will find deafness by bone and air conduction, but, as a rule, the degree of deaf-

ness will be greater by air conduction than by bone conduction.

Nerve—

(3) If the nerve itself is involved, the deafness will be total in high degree of neuritis, both by air and bone conduction.

(4) In partial acoustic neuritis the bone conduction will be reduced out of all proportion to the air conduction.

Total perception deafness must be either labyrinthine or nerve, but we should look upon certain labyrinthine forms as conductive perception deafness, remembering that there is a sound conduction function to the labyrinth, and that only actual nerve involvement, peripheral or distal, constitutes true perception deafness. A massive effusion into the labyrinth would cause a total labyrinthine deafness simply because sound vibrations could no longer be conveyed from the footplate of the stapes—the nerve, however, might remain perfectly normal. A partial effusion into the labyrinth might only involve the vestibule or the first turn of the cochlea: in such a case sound vibrations could not continue their course when heard by ossiculoperilymphic transmission; therefore, air conduction would show a greater reduction in duration of perception than bone conduction, though the latter would also be reduced. Bone conduction, we assume, is due to resonance created by the vibrations taken up by the skull, and, therefore, if the areas of the tectorial membrane which responds to a certain tone is not greatly involved, bone conduction will be better than air conduction. In other words, the vibrations by air conduction must make their way through an obstructed passage; by bone conduction they are directly received in an area specifically suited to respond by indirect transmission. In such a case the energy exerted by the vibrations upon the tectorial membrane is greater by bone conduction than by air conduction.

If the auditory nerve is involved and the labyrinthine structures are intact, the vibrations follow more closely the normal physical laws. That is to say, that the energy exerted by the vibrations is much greater by air conduction than by bone conduction. Vibrations conveyed by ossiculoperilymphic transmission would get through a partial "nerve block," whereas, the weaker vibrations of bone conduction, created

by resonance, would have no effect; and so, bone conduction would be much reduced in duration of perception, whereas air conduction might be, in slight cases of nerve involvement, almost normal.

To attempt to draw hard and fast rules along this line is, of course, impossible; the exceptions occur more often than the rule. As a question for study, however, I make the following classifications in cases of partial perception deafness:

(C) Partial labyrinthine deafness.

(1) The Weber usually referred to the better ear. At times to the bad ear in cases showing but slight reduction in bone conduction.

(2) The bone conduction for the C² fork reduced at least ten seconds in duration of perception, usually from one-half to two-thirds the normal duration.

(3) The air conduction for the C² fork negative or markedly reduced in duration of perception.

(4) The air conduction for the C fork negative.

(5) The air conduction for the C⁵ fork negative.

(D) Partial nerve deafness.

(1) The Weber referred to the better ear.

(2) The bone conduction for the C² fork greatly reduced or negative in duration of perception.

(3) The air conduction for the C² fork better in duration of perception, or reduced to the same extent as the bone conduction for the C² fork.

(4) The air conduction for the C fork of good perception duration in recent cases, reduced markedly in old cases, but never negative.

(5) The air conduction for the C⁵ fork reduced in duration of perception, or negative.

The basis of such a classification is the study of forty cases* of perception deafness which I have been able to make in the last year in my ear clinic at the Baltimore Eye, Ear and Throat Hospital, and in the Department of Neuro-Otology, which through the interest of Dr. Harry Friedenwald and with the cooperation of Dr. A. C. Gillis, we have been able to estab-

*This number has been increased since the paper was written, without change in result.

lish at the Mercy Hospital. In a later communication we hope to be able to show the importance of the hearing tests in conjunction with the vestibular tests of Bárány. In this paper I shall only speak of the examination of the cochlea branch of the eighth nerve.

Case 4.—Partial labyrinthine deafness. Wm. A. D., aged twenty-one years (B. E. E. T. H. 102,924), was examined May 20, 1916. He complained that he had been almost totally deaf since February. Gradual onset. The patient was so deaf that all questions had to be written.

Ear drums.—Right: Thickened and congested. Bulging in posterior portion. Middle ear seemed filled with thick secretion. Left: Presented the same appearance.

The patient had had no pain, no nausea, no vertigo. Denied lues. He had, however, been a patient at the Maryland Tuberculosis Sanatorium from January 3 to January 27, 1916, and was pronounced by Dr. V. C. Cullen "a progressive case of tuberculosis with an absolutely bad outlook." Dr. Hirshman, who examined the man in May, was of the same opinion. The hearing tests gave the following results:

HEARING TESTS BY AIR CONDUCTION.

The Weber was referred uncertainly to the right. The air conduction was negative for the C, the C¹, the C² and the C³ tuning forks under their maximum intensity. The C⁴ showed —22" (3/25) in the right ear, but was negative /25" in the left. The C³ fork was negative /10" in both ears. The Galton was heard at three turns in the right and at five turns in the left.

Here undoubtedly was a case of serous labyrinthitis of tubercular origin. The deafness was of the conduction type, but labyrinthine as well as middle ear. The bone conduction tests are of great interest and were as follows:

HEARING TESTS BY BONE CONDUCTION.

Right.		Left.
Negative /35	C ²	—25" (5/30)
—8" (7/15)	C ¹	—6" (9/15)

A paracentesis was done on both drums, which was followed by a thick, nonpurulent discharge that continued for some weeks. On June 7, 1916, his bone conduction had im-

proved for the C² fork, and he could hear the C fork for a few seconds by air conduction.

Right.		Left.
B.C. —23" (7/30)	C ²	—18" (12/30) B.C.
A.C. —84" (6/90)	C	—78" (12/90) A.C.

The discharge ceased and the drums resumed a partially normal appearance, and by October 9, 1916, he could hear a loud conversational tone. The bone conduction for the C² fork had increased to 35/35 in both ears. The air conduction for the C fork had increased to right, —50" (25/75); left, —30" (30/60). He still could not hear the C³ in either ear, and this was interesting from the standpoint that although bone conduction was normal for the C² fork, the C³ and C⁴ showed a decrease of —20" and —18" respectively. The tests of the vestibular apparatus, both by rotation and the caloric reaction, were of interest, and confirmed the labyrinthine affection. It is not the purpose of this paper, however, to go into that side of the question. The man's blood showed a negative Wassermann on two examinations.

Concerning tuberculosis of the middle ear, H. B. Graham¹⁰ has this to say: "In functional testing of cases of tuberculosis of the middle ear, one is nearly always struck with the disharmony between the remarkable deafness and the length of time and the severity of the attack. The reduced perception for the voice and the low tone is, of course, the most marked factor, but the perception quantitatively for all tuning forks is also markedly and rapidly reduced, so that one is reminded of the luetic cases he sees following salvarsan, suggesting that there may be some similar toxic effect in the labyrinth as well as a disturbance of conduction. In the later stages a complete deafness may occur without vestibular symptoms having developed, and on sectioning the labyrinth we find a complete replacement of the labyrinth by a caseous organized mass." The case (Case 4) which I have just reported follows closely certain cases reported by Graham. One is borne out then by the pathologic findings in assuming from the hearing tests that the lesion is purely labyrinthine and that it is not a toxic neuritis in the true sense of the word. On the other hand, nerve deafness due to lues is truly an eighth-nerve involvement, and the results of the hearing tests in a case of partial percep-

tion deafness due to syphilis, when compared to labyrinthine case (Case 4) just quoted, will, I think, bear out the differential diagnostic points to which I have called attention.

Case 5.—L. S., aged forty-four years, was seen at the Baltimore Eye, Ear and Throat Hospital, June 12, 1916. He complained of poor vision and failing hearing; the patient thought this had been progressing for about six months. He admitted lues of twenty-five years' duration. Treatment only during the first six months following the chancre. To report his general condition as briefly as possible, the man is a tabetic with partial optic atrophy, the vision of the right eye being 18/30, of the left 18/50 at the first examination. His pupils are unequal, the left being the larger, and the response to light is sluggish. Ophthalmoscopically the optic discs show atrophy to the temporal side, more marked in the left eye. The visual fields are contracted for form and colors, and there is a small central scotoma for red in the left eye. His patellar reflexes are absent. His hearing tests with the tuning forks are as follows, his tympanic membranes being normal in appearance:

June 12, 1916.					
Right.		Weber.		Left.	
B.C. —5" (30/35)	A.C. — 2" (73/95)	C ² —15" (47/62)	A.C. —25" (10/35)	B.C.	
	A.C. —10" (40/50)	C —10" (50/60)	A.C.		
	A.C. — 3" (7/10)	C ³ — 5" (5/10)	A.C.		

Note that in the left ear the Rinné shows a marked reduction by bone conduction as compared to air conduction. That the C fork is practically normal in duration of perception, but that the C² fork shows a reduction of five seconds, which with this fork indicates a marked degree of deafness for a tone of this pitch. This is the characteristic hearing defect found in syphilitic cases.

In recent years there has been a considerable study of the syphilitic affections of the internal ear, and the chief diagnostic point brought out by all authors is that there is a shortening of the bone conduction out of all proportion to the shortening by air conduction, with but slight shortening, or loss, for the sound of the low forks and a tendency for the forks of high pitch to be reduced in duration of perception. One of the most interesting articles concerning this subject

was presented by George H. Wilcut¹¹ at the San Francisco meeting of the American Medical Association in 1915. In this contribution Wilcut gives a good résumé of the subject to date, besides his own valuable observations, which include a far greater number of cases than had been studied by the majority of the authors quoted. The question of the pathology of the condition is somewhat uncertain, but the indications are that the lesion is most probably "a syphilitic infection of the nerve sheath."¹² Swift and Ellis¹³ believe that syphilitic deafness should never be considered an isolated entity, but a manifestation of cerebrospinal syphilis. Whether or not there exists a syphilitic meningitis in all cases is yet to be determined, but certainly all observers agree that deafness in these cases is due to a neuritis of the eighth nerve, either toxic or caused by increased intracranial pressure.

Physically speaking, it does not seem possible that the reduction by bone conduction in hearing power could be out of all proportion to the reduction in hearing power by air conduction, for if the nerve is affected, how can sound vibrations be perceived, no matter how well they may be conveyed? This has already been explained. By bone conduction the energy necessary to create resonance in the tectorial membrane is much greater than the energy necessary in vibrations carried by air conduction; therefore, in these cases of auditory "nerve block," the weak stimulation produced by bone conduction resonance is not sufficient to get through, whereas the stimulation produced by the powerfully reinforced vibrations, received and converted into the form best suited by the drum head and the ossicular chain, is sufficient to overcome the block. Though not exactly comparable, a similar condition is seen in the reduced peripheral vision of optic neuritis, with the retention of almost normal central vision. In the Mercy Hospital Dispensary we have been able to follow a creditable number of cases of acoustic neuritis accompanying tabes, cerebrospinal syphilis and other syphilitic central nervous system lesions which we hope later will furnish observations worthy of report.

In conclusion, my apology for presenting many well known facts is simply that the question of perception deafness and the use of the tuning forks is, generally speaking, in rather a

chaotic condition, regardless of the fact that many contributions to the subject are worthy of deep consideration. There is absolutely no standardization in the use of the tuning forks, each man using them as he pleases. Why should we persistently speak of "hearing" or "not hearing" a tuning fork, when a moment's thought will convince us that unless we know the intensity under which any sound is heard, its value as a measure of auditory power is useless? Why should we persist in the use of terms "negative" and "positive" Rinne, when we know that a "negative" is often found in perception deafness and a "positive" in conduction deafness? Why should we persist in comparing bone conduction and air conduction by a method that is most inaccurate, especially when by the use of the "noise apparatus" we may definitely determine the true bone conduction of each ear separately? And may not all these inaccuracies account for the report of but eight cases of internal ear disease out of seventeen hundred and fifty-three cases of ear disease (I take these figures from the report of one of the largest special hospitals in the South)? And yet no less an authority than Politzer says that the eighth nerve is oftener affected than any cranial nerve! I have no doubt that my paper is open to criticism. I make no claim for originality. Much that I have said has been said before, and better said. The work itself has required a great deal of patience, but as otologists we can do no better than to accept the opinion of Gradenigo: "That the proof based on the duration of perception of tuning fork sound furnishes, in pathologic cases, a deformed likeness of the hearing power; real progress of otology can only be reached when rigorous and exact methods in physical regard become established."

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The bibliography of the subject is, of course, exceedingly extensive. The author has made no attempt to give exact references except when it seemed necessary. The object has been to gather together into a workable whole those facts which are far enough removed from the hypothetical to be practical.



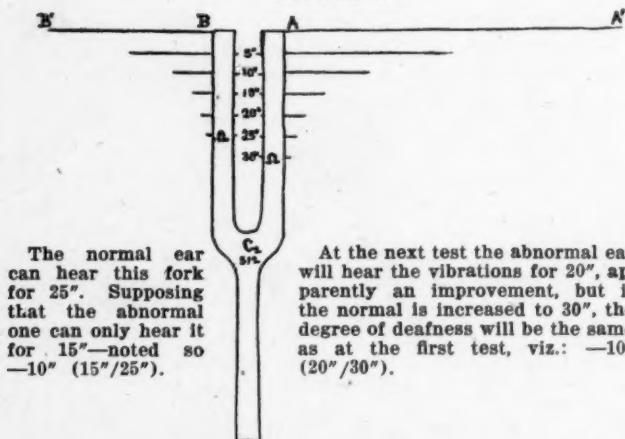
FIGURE 4.

FIGURE 1.

The incorrect impression of the decrement of the vibrations of a tuning fork.

The correct way in which decrement takes place.

FIGURE 2.

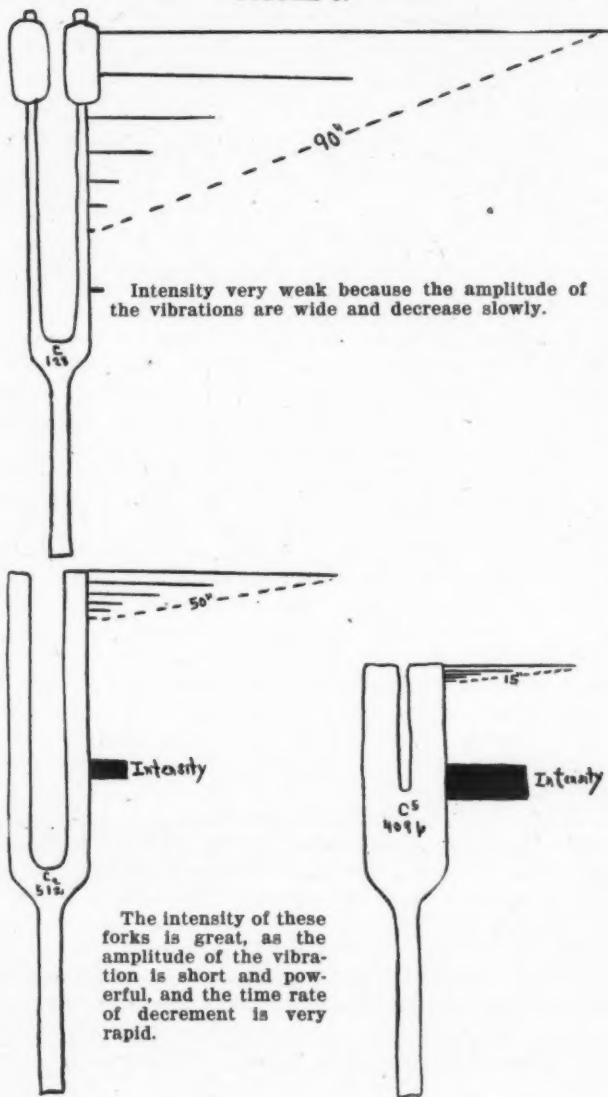


The normal ear can hear this fork for 25". Supposing that the abnormal one can only hear it for 15"—noted so —10" (15"/25").

At the next test the abnormal ear will hear the vibrations for 20", apparently an improvement, but if the normal is increased to 30", the degree of deafness will be the same as at the first test, viz.: —10" (20"/30").

The duration of perception is immaterial. It is the difference between abnormal and normal perception which is the important factor.

FIGURE 3.



III.

SUPPURATIVE LABYRINTHITIS—A CRITICAL REVIEW OF ITS DIAGNOSIS AND TREATMENT.*

BY ARTHUR B. DUEL, M. D.,

NEW YORK.

Although the subject of orientation and equilibration, and the intimate connection of the vestibular apparatus with this function, have occupied the attention of otologists for more than a century, and, although much of the most important experimental work connected with it was done thirty or forty years ago, the surgery of the internal ear lesions resulting from inflammatory invasion has been developed well within the past two decades. I remember in the course of a summer in Berlin, about fifteen years ago, seeing the operation for suppurative labyrinthitis performed by Dr. Jansen on two chronic cases and one acute case. At that time the test for loss of hearing was very inadequate, and no one had suggested separate examination of the vestibular apparatuses. I recall that the operations impressed me with the importance of more careful anatomic study of the petrous bone with reference to operative interference, and that the technic of the operation interested me much more seriously than the diagnosis or the indications for operation.

It was not until Bárány, about ten years ago, presented the noise apparatus, which enables one quickly and positively to demonstrate complete loss of hearing, and the caloric reaction, which enables one to test separately the presence or absence of the static function, that surgery of the labyrinth was placed upon its present sound footing. Compared with all other means for determining the necessity of surgical interference in the internal ear, these two tests stand out in paramount im-

*Read at the meeting of the New England Otological and Laryngological Society, Boston, November 23, 1916.

portance. Indeed, in my own opinion, they are the only necessary functional tests. While the other functional tests, like whirling and the galvanic current, are interesting and useful in clarifying our minds regarding the static function, and therefore valuable in demonstrating certain reactions in the study of the subject, when we get down to an actual clinical case on which the question of surgical interference is to be settled, they are, to my mind, useless in comparison with the ones first mentioned. This is due to the fact that the whirling test can never cause a reaction in one vestibular apparatus at a time; and despite the fact that an imbalance of the two apparatuses may be demonstrated by the after-nystagmus resulting on turning first in one direction and then in the other, it is well known that compensation takes place sometimes in a longer, sometimes in a shorter, period after complete destruction of one side; and therefore a negative result will never be convincing. I believe it is absolutely useless in acute cases when a spontaneous nystagmus is present; and may be so in the chronic cases, owing to partial or complete compensation by the sound side. It seems useless in the acute cases, because with an imbalance sufficient to have caused the spontaneous nystagmus, the added confusion of the whirling brings out only phenomena which it is almost impossible to observe accurately. From another point of view, even if the information gained should be accurate, it seems hardly wise to jeopardize the chances of recovery of so ill a patient by subjecting him to this additional insult, when a much more positive test (the caloric) may be used with comparatively little discomfort. The whirling chair, in my opinion, then, should be relegated to the armamentarium of those who are teaching or studying the phenomena of static equilibrium, and should be discarded as a positive diagnostic factor in labyrinthine surgery. No one would think of not verifying its positive indications by the more accurate caloric test, and no one should accept its negative indications as being of any particular value.

The galvanic reaction, while it enables one to test each labyrinth separately, is confusing, from the fact that it may excite reactions by stimulating the vestibular nerve trunk, even when the end organ is not functioning. It is, therefore, in my

opinion, useless except for the teacher or student, and is of no positive aid in determining the necessity for surgical interference, as compared with the caloric reaction.

These two tests stand in relation to the surgical diagnosis of labyrinthine involvement in about the same importance that transillumination occupies in the diagnosis of accessory sinusitis. Transillumination may be of positive value or it may not; in these days of radiography, no one would think of accepting its most positive indication without the confirmation of a radiogram.

The "fistula test" may be positive, in the absence of a positive caloric reaction, or it may be negative in presence of a positive caloric reaction. This, of course, will depend on whether there is a fistula present or not, and whether there is a vestibular function present or not; but one will seldom find a fistula test positive without also finding a caloric test positive, although it may be delayed or weak; while the fistula test, even in the presence of fistula, has no diagnostic value unless it is positive.

There is another important feature in connection with this test—and since I am on the subject, I may as well finish it now, although it may be somewhat out of place. The fistula symptom is present only in cases in which a suppurative process has extended to the membranous labyrinth, either by erosion of bone, by a necrotic process, or by extension through a dehiscence in the bony capsule. We seek for it in cases in which the symptoms point to a lesion which has not invaded the endolymph. This is in a type of cases (the so-called circumscribed) which often suddenly become active, acute, and develop into the most serious complete endolabyrinthine involvement. When we find a fistula during the course of an operation, every surgical instinct urges us not to probe or in any way exert the slightest pressure or traumatism on the fistula, and we so instruct our students. (This applies to cases where a functioning labyrinth has been demonstrated.) Under these circumstances, who can say that the fistula test once applied may not be the cause of converting a perilabyrinthitis into an acute diffuse suppurative one. The pneumatic pressure necessary to bring about the test cannot be calculated to fit all cases,

and certainly the fistula test, applied as we usually see it, is quite as dangerous to the welfare of the patient as the probing or curetting during an operation—which we all abjure with such holy horror.

If the caloric test is positive, then, or can be demonstrated in even its weakest degree, one can well afford, in the interest of the patient, to wait and discover by inspection at the time of a radical operation whether or not a fistula is present. If the caloric test is negative—hearing also being entirely ablated—there might be a slight justification in applying a fistula test to determine whether or not there is any remaining vestibular reaction. With any hearing present, however, there would be sufficient contraindication to operative interference on the labyrinth to make the fistula test unnecessary, since at the time of the radical operation this might be determined by actual inspection. Here again, then, a test which is interesting and often very illuminating can only be practiced with certainly always a slight, and in many cases a grave, danger to the patient. If this test is used at all, it should be undertaken with great care, using the slightest pressure at first, and only increasing it on negative results up to a point (which must be guessed at) which the investigator thinks would not be sufficient to break through the delicate endolymphatic membrane. Having once demonstrated the presence of a fistula by this method, I consider it very bad practice to go on demonstrating it repeatedly, as we often see done for the illumination of one surgeon after another, in both hospital and private practice. The life of the patient with such a lesion is so seriously menaced by possible extension into fatal areas by the experiment, that one should—if he attempts it at all—record the result once for all.

This leads me into another digression. Much of the experimentation or demonstration of various interesting phenomena connected with an inflammatory involvement of the labyrinth might, in the interest of the patient, be well taken for granted. For example: as I have just said, if you will make use of a dangerous fistula test, you might at least be conservative enough, if positive, not to repeat it. If a patient suffering with an acute labyrinthitis has manifested symptoms

which show that both the hearing and static sense are ablated, you may as well take it for granted that if made to stand he will fall toward the side of the lesion; that if whirled he will probably show certain reactions; that if moved about he will exhibit nausea and vomiting. Now, in most of the cases reported we see these results recorded. We all know that these phenomena would have occurred, and the man who has demonstrated them again has done so to the detriment of his patient; for we know that perfect quiet is absolutely essential to the prevention of extension from an endolabyrinthine lesion to the meninges, and may be so for the prevention of an extension from a peri- or paralabyrinthitis into the endolymph. To say in one breath that a patient should avoid undue excitement and any action which might jar the delicate barriers which nature is attempting to erect to prevent extension, and in the next breath to take such a patient out of bed to demonstrate that he will fall in a certain direction on attempting to stand or walk; or that he will show certain reactions to the insult of whirling him in a revolving chair; or even to stirring him about in bed or sitting him up in order to demonstrate a difference in the direction of nystagmic movements; or to provoke nausea and vomiting, is, to my mind, an exhibition of bad judgment or bad practice in the management of the case.

All these questions of whether the patient will fall in a given direction or react to certain experiments have been settled; we know they will do it. If that is unknown ground to any one, he should either accept it as a fact established by others, or learn it for himself on chronic cases, operated cases, and animals, rather than to demonstrate it by experimenting on his acute case, in which the demonstration may be the last straw which "breaks his camel's back."

This leads me to another somewhat critical position regarding the clinical diagnosis of labyrinthitis. We are deeply indebted to the Vienna school for their painstaking efforts to record the last detail of their cases, for their enthusiastic rivalry to present some new phase of an intricate subject, or some added factor in the differential diagnosis of the various types of labyrinthine inflammation. Their efforts to subdivide their cases and reduce each one to its lowest terms have

been due in part, I think, to a desire to present a fixed or standardized formula, with definite symptoms for each and a definite treatment for each. This might, at first thought, seem to simplify the matter for students. I believe that instead of accomplishing this object, they have unnecessarily complicated the question, and have led those who approached their first cases of labyrinthitis into a feeling of bewilderment lest they should fall into a wrong diagnosis, on the one hand; or lest they should misinterpret the clinical symptoms and be led into performing an unwarranted operation, or be influenced in too long deferring a necessary one. The cases I am speaking of are all those which have resulted from a suppuration in the middle ear. The question which confronts one in such a case is: Is this acute or chronic? We know that no acute case of labyrinthitis can be present without manifest symptoms. We must remember that symptoms of an acute labyrinthitis may be present in either an acute or a chronic suppurative otitis. The first evidences of an acute inflammatory involvement of the labyrinth are impairment or loss of hearing and tinnitus aurium from involvement of the cochlear apparatus; and loss of equilibrium, vertigo, nausea and vomiting, and nystagmus resulting from loss or impairment of the vestibular apparatus. Either one or both of these impairments or loss of function may be present in any acute case. If either function is present in any degree, it is safe to say that an acute suppurative endolabyrinthitis is not present at that moment. If both functions are ablated the case may or may not be one of acute suppurative endolabyrinthitis. If the loss of function has been very rapid (within a few hours) following a virulent acute suppurative otitis, or following the fistula test, or any operative interference in a case in which there has been a perilabyrinthine inflammation, the chances are greatly in favor of the lesion being an acute suppurative endolabyrinthitis. If such is the case there will be no return of function, even though the case recover without operation. On the other hand, if the loss of function came on slowly, with irritative symptoms showing first for a number of hours, or days, or weeks, there may be an eventual complete loss of both functions, followed by final recovery or partial recovery of one or both, provided the labyrinth is not operated.

It can be readily seen from these incontrovertible facts that in any case of acute labyrinthitis we are brought face to face with the question of whether or not we shall operate upon a case which is in imminent danger of an intracranial involvement. The clinical symptoms from which we are able to elucidate the question may be indetical, and if all cases were operated upon to relieve such symptoms, there would undoubtedly be some which, had they been let alone, would have recovered with considerable function; on the other hand, some might be caught at the proper moment and drained with sufficient skill to prevent an intracranial involvement; and still again, there would undoubtedly be some cases in which the operative interference itself would precipitate the very cataclysm which the operator was endeavoring to avert. By this I mean that the excavation of bone necessary to accomplish the drainage—removed in the most ideal method imaginable—cannot help but be a menace to the delicate fabric which nature in every such case is attempting to erect between the meninges and the infected area. The thought of this great danger of traumatic production of the very mischief one is trying to avert has been growing upon me for years, and although I have carefully avoided employing mallet and chisel—the use of which I consider extremely bad technic on account of the violent concussion—I still feel that in these acute cases even the most careful excavation by the use of rongeurs, curettes and drills will in a slight degree present the same possible danger.

Under these circumstances I am strongly of the opinion that any acute labyrinthitis showing no symptoms outside of the labyrinth stands a better chance of recovery unoperated until the acute symptoms have subsided. This may mean—depending upon the condition of the mastoid—a few days or a few months, or for all time. During this stage of acute symptoms the endeavor should be to secure complete rest for the patient. If there were a question of whether I would operate upon such a patient or not operate, and in the meantime subject him to the insults to which he is usually subjected, I would say by all means operate. I mean by this that to take such a patient and stand him up or ask him to endeavor to walk to

note which way he falls; or have him sit up in bed and put him through hot and cold water irrigations; or put him in a whirling chair and revolve him several times in each direction; or in any way disturb him so as to provoke the violent vomiting which such patients are likely to have at that time, is quite as likely to add the traumatic shock which might break down the barrier to the meninges, as a carefully wrought operation, but without presenting him with the advantage which the drainage afforded by the operation would provide.

Now, what symptoms are necessary to hold us in this waiting position?

Just two. (1) Loss of hearing. How is this demonstrated? With a suitable noise apparatus shutting out the sound side, the patient is unable to hear shouted words or a Galton whistle. (2) He has a nystagmus of the vestibular type, the slow movement of which is toward the diseased ear. (I shall speak more at length on this symptom a few moments later.) It does not matter whether the nystagmus is horizontal or rotary in character; you simply wish to know if a nystagmus characterized by a slow movement in one direction is followed by a rapid movement in the other direction. If the slow movement is toward the diseased side (it is almost sure to be if the hearing is ablated), it is the result of a great impairment or a complete loss of function on the diseased side. It is almost always rotary, or combined rotary and horizontal; but it is quite unnecessary to be too accurate about whether one or both are present, so long as there is a characteristic slow movement toward the diseased side, followed by a rapid movement in the opposite plane toward the other side. If once or twice in your lifetime you see the slow movement away from the diseased side, with quick recovery toward it, you may be certain that the labyrinth is functioning; that the nystagmus is the result of stimulation; and that the case has no question of a possible operation in sight, because there can be no endolabyrinthitis present. In such a case there would also almost certainly be some hearing present.

We all know that the acute symptoms in such cases rapidly subside. The function—hearing, static sense—may partially recover, entirely recover, or be completely lost. This applies

to one or both. In the meantime a condition will be left in the labyrinth, depending upon what sort of resolution takes place. Of course, the cases which recovered function did not have a suppurative invasion of the endolymph. It is even possible that some of the cases which recover with loss of function may not have had a suppurative endolabyrinthitis. This is drawing pretty fine, however, as all of them have had an inflammatory invasion of the labyrinthine walls sufficient to upset or completely destroy the function of the delicate end organs in the cochlear and vestibular apparatus. The distinction only indicates how imminent meningeal involvement had been. There is no way of knowing which is present at the time. The case will either have recovered with or without function, or will have rapidly passed into what, for all practical purposes, may be considered a chronic labyrinthitis.

What symptoms during this anxious period of waiting should lead one to operate?

First, a temperature over one hundred degrees, accompanied by headache, photophobia, exaggerated reflexes, a positive Kernig, might be an indication that a beginning meningeal irritation was taking place, and no one should hesitate for a moment to operate, not only draining the labyrinth spaces, but also uncovering and incising the dura as nearly as possible at the internal auditory meatus and possibly over the temporo-sphenoidal lobe as well. This operation would be done, not for the labyrinthitis, but for a beginning meningitis which had not been averted by jealous care and watchfulness.

Another situation might be present which would present some of these symptoms and which might justify an operation in the midst of an acute labyrinthitis, but which might not demand an invasion of the labyrinth. This situation is more likely to arise in an acute labyrinthitis coming rapidly on top of an acute otitis before or without any clinical evidence of involvement of the mastoid. Such a case might be running a high temperature, owing to an acute follicular tonsillitis or an acute nasopharyngitis, or from an acute suppuration of one or several nasal accessory sinuses, the direct infection of the middle ear having occurred in the midst of their acute symptoms. Headache might be present from high temperature;

there might be some question of stiffness of the neck from glandular infection; there might be a questionable or very positive evidence of an acute mastoiditis or a sigmoid sinusitis. In such a case I believe one is warranted in operating the mastoid with as little concussion as possible in the presence of an acute labyrinthitis, being guided at the time of operation as to whether or not the labyrinth should be drained, by a spinal puncture and examination of the fluid for symptoms of meningitis. This can be done, where laboratory facilities are easily available, without any delay, the report being returned to the operator long before the mastoid excavation has been completed.

In the absence of evidence in the cerebrospinal fluid of a beginning meningitis, I should, even under these circumstances, advise leaving the labyrinth alone. I am quite aware that this practice is considered too hazardous by many, but my own experience and that of others with whom I have seen cases, has been fortunate enough to warrant that conclusion—for the present at least.

Reverting for a moment to the subject of spontaneous nystagmus (one of the manifest symptoms of acute labyrinthitis), you will notice that I spoke always of the slow movement of the nystagmus first, and always of the slow movement as one of diagnostic importance. You are aware that all nystagmus of a vestibular origin is characterized by a slow movement in one direction, followed by a quick recovery movement in the opposite direction. You are also aware that the slow movement is the only one for which the vestibular sense is responsible. It is a very good thing also to keep constantly in mind that the slow vestibular movement is always away from the side which is exerting the most powerful influence. The vestibular impulses which keep us constantly informed of our position in space and influence our vision in fixing on moving objects, or on stationary objects whilst we are moving, might, for purposes of demonstration, be compared to a billiard ball held in a stationary position by three rubber fingers on either side, by an equal pressure from three different angles. You can well imagine that the least let-up in tension on any of the fingers would mean that the stronger pressure from its op-

posing finger would move the ball toward the weaker side. Now a labyrinthine stimulation might increase the impulses on that side to make a stronger "push" than that of the opposite normal side; the eyes would then rotate slowly toward the normal side, making a rapid recovery movement toward the stimulated side. This may happen in the very earliest stages of labyrinthine involvement. It may be induced by hot irrigations.

In an involvement of the labyrinth which in the least impairs or destroys the function of the vestibular apparatus, the impulses from that side are weakened or ablated entirely. Going back to our billiard ball, the normal impulses from the sound side will push it toward the weakened one. The vestibular movement of the eyes (the slow movement of any vestibular nystagmus), then is invariably away from the side sending out stronger impulses, so that it follows that a slow movement away from a diseased ear must mean increased functioning of an overstimulated vestibular apparatus.

On the other hand, a slow movement of the eyes (of vestibular origin) toward a diseased ear, cannot be anything but the result of a weakened or absent function on that side. The normal impulse of the sound ear has produced this imbalance.* Suppose that we imagine another influence, quite outside of the little rubber fingers, which intermittently, violently and rapidly jerks the ball back to its original position by a much more powerful impulse than they exert. This would typify a central influence on the eye acting from a center quite separate from the vestibular apparatus, which in vestibular imbalance is entirely designed as a compensatory act. Why under such circumstances have we fallen into the habit of naming the nystagmus from this quick compensatory movement, instead of from the slow movement, absolutely of vestibular origin? Even if it does not upset our train of thought in

*Note.—I wish to make it quite plain that I am speaking of vestibular lesions only. It is well known that a cerebellar lesion would produce a nystagmus in just the opposite direction. Destruction of a labyrinth would induce a nystagmus, the slow movement of which would be toward the destroyed side. Subsequent involvement of the cerebellum on that side would reverse the nystagmus. There are many differentiating phenomena brought out by pointing tests, direction of falling, etc., a discussion of which is quite beyond the limits of this paper.

observing any case with labyrinthine symptoms, it only fails to do so because we transpose our terms. We cannot think of it properly without transposition; therefore, why should we not at least cease designating nystagmus by the direction of the quick recovery movement?

We might say, in describing symptoms, that a nystagmus of vestibular character is present. This would mean that there is a slow and a quick movement; if we wished to be logical, we might say the slow movement (the vestibular one) is away from or toward the diseased ear, as the case might be. Without transposition of terms the beginner, and the experienced diagnostician also, for that matter, might then have a definite notion of what was happening in the vestibular apparatus.

We have thus far said nothing about the diagnosis or treatment of a chronic case. All chronic cases are characterized by the fact that there are no gross manifest symptoms. We discover indications of a chronic labyrinthitis in the course of a functional examination of a case of suppurative otitis which has formerly passed through an acute labyrinthitis with destruction of both hearing and static sense. The clinical history of a previous train of symptoms similar to those just recorded in the acute case might lead us to expect to find such a lesion. The demonstration of the presence of a dead labyrinth is perfectly simple. The functional test of hearing will show its complete ablation. The caloric test will show complete loss of function on the diseased side. You will remember that for practical purposes I included as chronic cases all acute cases which had ceased to exhibit spontaneous evidence of labyrinthine involvement. There is no need whatever of hesitating to employ for purposes of experimentation any of the tests which were so severely criticised in the investigation of acute cases. The rotation test may demonstrate a very marked imbalance in the vestibular apparatuses, the after-nystagmus resulting from rotation in one direction being much more marked than that in the other. If this is the case, standing with the eyes closed; walking forward or backward with the eyes closed; walking forward and suddenly looking in either direction; attempting to do things in the dark which formerly could be easily done; standing on one leg; walking or stand-

ing on an inclined plane, will all, in various degrees, show an unstable equilibrium, amounting in some cases to a complete loss. If he is whirled and his head placed in one position, he will fall in a certain direction; and if whirled and the head placed in another position, he will fall in another direction. The extent of his response to these experiments will depend upon the rapidity with which he has compensated for the loss of function of one of his vestibular apparatuses.

In a general way the length of time following the complete destruction will have much to do with his responses to these experiments. Nevertheless, just as one person may learn to walk a narrow plank or do some unusual athletic feat very quickly, while another may take a long time to do it, or never be able to do it at all, so we may measure the variation in compensation for the loss of one static apparatus that we may find in any such case. It follows, then, that after all, no matter how many experiments we may try from an interest in the phenomena, we are led always to the confirmation of any evidence we may derive from them by the result of the caloric reaction. If there is any remaining function in either the cochlear or the vestibular apparatus, an operation for drainage of the labyrinth is unjustifiable.

For practical purposes, therefore, if we have neither the time, nor the apparatus, nor the inclination, it is not necessary to do more than make the functional tests of hearing and the caloric test for vestibular reaction, in order to determine, so far as the functional test goes, whether or not a chronic labyrinthitis should be subjected to operation. To my mind, a fistula test in these cases is fraught with quite as much danger as in the acute cases, because one never knows how large the fistula may be or how insecure the barrier which nature has erected between the meninges and the suppurating focus.

It has been stated by a man of wide experience, and reiterated by many who have followed him, that complete compensation for loss of function on one side is a contraindication to invasion of the labyrinth on the dead side while doing the radical mastoid, on the ground that in such cases the labyrinth had been healed by the deposition of bony or fibrous tissue in place of the former purulent material. This seems an irra-

tional conclusion, inasmuch as I have operated on several cases in which the whirling test showed almost perfect compensation, yet which at operation revealed necrosis of the labyrinthine wall and purulent foci in both the cochlea and vestibule.

The fiat has gone forth from another man of large experience, and has been widely accepted, that no radical operation should be performed on a chronic suppurating ear, in which a dead labyrinth has been demonstrated by functional tests without opening the labyrinth at the same time. This also I think is an unwarranted conclusion, inasmuch as a radical operation on such a case of very long standing seems justifiable without invading the labyrinth, unless a very definite lead into the labyrinth is revealed on careful inspection. This is well demonstrated by the conclusion just mentioned by the other man of wide experience. From my own experience, I would say that no radical operation should be done on an ear showing a dead labyrinth without the intention of entering the labyrinth if careful inspection showed any lead in that direction. The reason why this fiat went forth was, I believe, because so many such cases operated, without drainage of the labyrinth at the same operation, resulted in the conversion of a latent focus in the labyrinth into an acute meningitis. The cause for such a catastrophe could only be attributed to a traumatic rupture of barriers which had been walling off the purulent focus from the meninges. This only emphasizes the position of those who insist that operation in such cases should be done with extreme caution for the avoidance of concussion or rough manipulation of any area which might possibly be leading into the labyrinth, unless such manipulation was to be immediately followed by free opening into both vestibule and cochlea.

Those who will operate with such care that they feel certain they have not broken down barriers which have held for months or years, may, if they find no lead into the labyrinth, safely omit drainage of the labyrinth with the expectation that the majority of such cases will recover without it. Occasionally a case may require later a labyrinthine exenteration, owing to the fact that latent foci of infection were present which did not show sufficiently gross evidence on inspection to lead the

operator to enter it at the first operation. It is my conviction that this practice would avoid the necessity of the more extensive operation in many instances, and would not subject the patient to added danger in those cases that may require the second operation.

A word as to the kind of operation advisable in these different cases.

Inasmuch as no acute case is operated unless early symptoms of meningeal involvement are present, it follows that any operation is inadequate which falls short of draining the dura at the same time that the labyrinth is opened. Such cases should have the vestibule opened both in front and behind the facial nerve, the cochlea uncapped, and the scala and modiolus entirely removed so that the meningeal fluid washes freely through. The plate from the lateral sinus to the petrous pyramid should be entirely removed, a slit made in the dura as near the internal auditory meatus as possible, and drainage of the meninges at that point facilitated by a ribbon of rubber tissue inserted through the slit. A similar drainage of the temporosphenoidal region should be made, if there is evidence of rapidly extending meningitis.

Any chronic case exhibiting evidence of meningeal involvement should have a similar operation. The chronic case, however, which exhibits only a suppurating labyrinth, should be opened in front and behind into the vestibule, the cochlea uncapped with extreme care, to avoid breaking the modiolus down to a point which will open a communication with the meninges. If the granulating suppurating cavities are opened and washed out, they will heal rapidly. It is quite inadvisable, in my opinion, to curette granulations from these cavities, for fear of opening up an avenue of infection either through the aquaeductus cochlea or the aquaeductus vestibuli. It is advisable to avoid removal of these protecting granulations, just as we now avoid curetting the granulations in epidural or perisinus abscesses. Free exposure, washing and adequate drainage will be more successful. The removal of the inner plate from the sinus to the petrous pyramid in these cases, without any meningeal symptoms, prolongs the operation and increases the danger, without in any way aiding the recovery of the lesion.

I have said nothing definite about the classification of inflammatory conditions of the labyrinth, except to hint at the idea that it had been made too complicated. You will note that I have only mentioned acute cases in which the endolymph was invaded, and those which gave active symptoms from the perilabyrinthine inflammation. I have no idea of insisting that the classification into circumscribed labyrinthitis, diffuse serous secondary labyrinthitis, diffuse purulent manifest labyrinthitis, and diffuse purulent latent labyrinthitis should not be adopted if you wish to do it, but I do insist, since they all arise from a suppurative otitis, that you will be unable to differentiate between the diffuse serous secondary and the diffuse purulent manifest labyrinthitis in the majority of cases, except by time and the outcome regarding function; and that having made this distinction, even on that evidence, you may often still be wrong.

Dr. John B. Rae read a very excellent paper on "The Diagnosis of Inflammatory Diseases of the Labyrinth" before the Medical Society of the State of New York, at Saratoga Springs May 16, 1916, in which he simplified the classification into: (1) Acute diffuse labyrinthitis; (2) chronic diffuse labyrinthitis; (3) paralabyrinthitis—(a) with fistula; (b) without demonstrable fistula. To my mind, this covers the ground quite sufficiently, and includes all the cases under the more confusing classification first mentioned. If it were to be put to a vote, I might offer the amendment that the conditions be called: (1) Acute endolabyrinthitis; (2) chronic endolabyrinthitis; (3) paralabyrinthitis—(a) with fistula, and (b) without demonstrable fistula; but I am not at all sure that the amendment might very justly be voted down in favor of the original proposition.

IV.

GUMMA IN FOSSA OF ROSENUELLER CAUSING DEAFNESS.*

BY ISAAC M. HELLER, M. D.,

NEW YORK.

Mrs. H., aged forty-one years, married, called October 25, 1916, complaining of deafness in the left ear. This had been growing progressively worse for three weeks, and the sense of fullness was most annoying. She denied all knowledge of any initial lesion, was the mother of three normal children, and aside of a seven months' stillborn child between the first and second children, there was nothing to suggest a luetic infection.

Examination of left ear showed a decided retraction of the drum, but no adhesions. Right ear, normal to hearing tests. Left ear, conversation, twelve feet; whisper, eight feet; acoumeter and watch, five feet; Weber to left; Rinné, positive; Schwabach, normal; large C and small C⁺ forks heard, but not so well as on the right side.

The nose and mouth were negative. With the postnasal mirror, however, a mass was readily made out in the left side of the nasopharynx. It extended from the posterior wall forward to the palate, precluding a view of the lower and middle turbinates. At the site of the eustachian tube was a slight dimple or depression. Passing a catheter into this failed to inflate the ear. No undue force was used, as the diagnosis was not fixed, and I did not want to cause any trauma which might result in cicatricial contraction of the tubal orifice. This mass was about the size of a hickory nut. Surface was more or less covered with a false membrane, interspersed with smaller areas of reddish tissue. It seemed quite firm to touch

*Read before the New York Academy of Medicine, Section on Otol-ogy, December 8, 1916.

of the catheter, did not bleed, and was not tender on pressure. Tumor was even better seen through the nasopharyngoscope of Holmes.

The diagnosis lay between a malignant growth and a gumma, with a decided leaning toward the latter, despite the negative history. Tuberculosis was ruled out because of the single growth, lack of erosion, healthy appearance of surrounding tissues, and absence of larynx and lung involvement. There was no glandular enlargement. A competent pathologist reported a four plus Wassermann.

On November 3d and 10th I injected neosalvarsan gram 0.45, and on November 23d, gram 0.60, intravenously. She was likewise put on a fifty per cent solution of sodium iodid with mercury inunctions. Reaction was prompt. After the first injection the mass was reduced by one-half; after the second, the tube could be catheterized, while after the third, hearing was equal to that of the right ear and Rosenmüller's fossa was free.

Examination of the literature shows this form of solitary tertiary lesion to be quite uncommon. Mucous patches of the secondary stage throughout the mouth and pharynx are frequently seen. Likewise a gumma of the soft palate with perforation and cicatricial contraction is often encountered. The interesting point in the case cited is the total freedom from symptoms referable to syphilis. If she had not noticed a disturbance in hearing, she would have sought no medical advice until sloughing of the palate had occurred.

Gerber reports a similar case, where, however, there was a clear history of primary infection some six years previous. In his atlas he shows an excellent reproduction of this condition, but there is an added involvement of the uvula. Gerber concludes by maintaining that tertiary syphilis can be present and concealed in the nasopharynx without any other manifestation of the disease elsewhere about the body. This is quite important to remember, since such a neglected case would surely be followed by ulceration of the soft palate or tubal opening, and more or less stenosis be the result. A small lesion is readily overlooked, especially where posterior rhinoscopy is difficult or impossible. It is here that the electric nasopharyngoscope of Holmes is of distinct value, and it should

always be used where the otoscopic findings do not fully account for the disturbances of hearing.

A negative specific history should never mislead one in his conclusions, for with improved technic in serodiagnosis, cases of mild, overlooked syphilitic infection are yearly becoming more frequent. To illustrate, let me give briefly a hitherto unpublished case related to me by Dr. A. Rostenberg:

A married woman came to him with a diffuse papular eruption scattered about the body. It looked suspiciously like a secondary syphilide. Possibility of a primary lesion was denied. On close examination he discovered a scar the size of a dime on the sternum just below the clavicle. She stated this to be the site of a sore some five weeks before. He consulted the physician then in attendance, who said it was a hard indolent ulcer, yielding slowly to aseptic treatment, and lasted about four weeks. Because of its unusual location, he gave no thought to syphilis. Further investigation brought to light the fact there was a boarder in her house who had had a chancre, and that the patient took care of his linen. Contaminated finger nails and a scratch on the breast completed the chain of evidence. Subsequent Wassermann was strongly positive.

If this woman had disregarded her rash, which was of mild degree and apparently unimportant, she would have been totally innocent of the source of infection. Some years later, seeking relief from a tertiary lesion, she would have indignantly denied the possibility of lues.

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V.

A CONTRIBUTION TO THE HISTOPATHOLOGY OF
THE NOSE AND THROAT.*

BY LOUIS K. GUGGENHEIM, M. D.,

ST. LOUIS.

For many years the writer has been conscious of a certain feeling of shame in connection with his specialty: this feeling has resulted from the observation that whereas in practically all other fields of medicine, men who are preparing themselves for their life work begin with the fundamental studies of all branches of medicine, histology and histopathology, men who are fitting themselves for service to humanity as otolaryngologists usually begin with a mad desire to perform tonsillectomy, submucous resection of the septum, etc., and never do, with but few exceptions, apply themselves to the acquiring of the basic knowledge of their specialty, namely, the histology and histopathology of the nose, throat, and ear.

This neglect to build the foundation is probably more noticeable in Europe than here in America, where not so many men are found in one locality preparing themselves for a specialty. Practically all physicians who go to Europe to study, with the exception of otolaryngologists, devote much of their time to the study of pathology. The writer knows of many surgeons, for example, who have devoted practically all of their time in Europe to anatomy and pathology, and is unable to think of a single man, with the exception of otolaryngologists, among the hundreds whom he has met in Europe, who did not realize the necessity of fundamental

*Thesis accepted by the American Laryngological, Rhinological and Otological Society.

work. How is it with the would-be otolaryngologist? Over to Europe for a few weeks or a few months to "learn" his specialty, he wants to know, fifteen minutes after his arrival in Berlin or Vienna, where he can get some operating, either on the cadaver or the living. Embryology, histology, histopathology! What can he do with such knowledge in his office when he returns? He smacks his lips over the fees he will demand for a radical mastoid, a septum operation, etc.

No honest man can deny the fact that of all the specialties of medicine there are more superficial men practicing otolaryngology than any other branch of our science. Now, there is no argument whatever concerning the fact that even without knowledge of histology and histopathology one can get along in otolaryngology: one can even do much good in this world. I know men who remove turbinal hypertrophies, tonsils, and adenoids, who can perform a septum operation, simple and radical mastoid operations, etc., all very beautifully; men who have large incomes and help their patients, but how about progress in otolaryngology, and how about genuine satisfaction in one's work? These are impossible in the absence of a perfect understanding of the things with which one is dealing. Ah! yes, one hears, that is all very fine in theory, but practically why isn't it just as well to send the specimen to a pathologist for a diagnosis; and why bother about cells and groups of cells as long as one can recognize the macroscopic condition and treat it properly! I say such an attitude is disgraceful. In a specialty as limited as that of otolaryngology, it is a shame that men can be satisfied with a knowledge of the mere facts necessary for them to make a living and necessary to the carrying out of routine treatment and operations. Have we no pride in our special work? Have we no desire to compete with those in Europe who have worked out the problems about which we in America write so learnedly?

This contribution of microphotographs has been selected from a series of ninety-six recently taken by the writer, who is not a pathologist but an otolaryngologist, and invites criticism of his descriptions.

It is a significant fact that, although the books dealing with otolaryngology are numerous, but few contain more than a mere mention of the histology and histopathology of nose, throat, and ear; and even in those which contain splendid chapters upon pathology, we usually see sketches of specimens which may or may not be true to nature. Why so little use has been made of the microphotograph in otolaryngology is difficult to explain. Possibly the erroneous idea that microphotography is very difficult is the explanation. Microphotography is not difficult; a certain amount of technic must be acquired, of course; but this is possible for anyone with ordinary intelligence.

This contribution, the writer hopes, will serve to stimulate a deeper interest in the groundwork of laryngology, and serve as a plea for the more widespread use of this admirable method of illustrating papers and books.

There is an almost irresistible temptation to overstep the bounds of pathology in discussing each specimen, but, in a short work of this kind, one must confine himself strictly to the subject in hand.

TECHNIC.

The specimens were all fixed in four per cent formalin; then passed through the usual alcohol series, after being washed in water. They were then embedded in celloidin and sectioned in the usual way. Almost all the specimens were stained with hematoxylin eosin and mounted in the customary manner. Each specimen was carefully studied and the most interesting field selected for photographing. A Leitz microphotographic apparatus was employed. Most of the pictures were made with the first objective, a few with the second, but none with the oil immersion. An arc light is used in the Leitz apparatus for projecting the image. After focusing on a ground glass the light was modified with a ground glass and an amber glass. The exposures varied from five seconds to fifteen seconds, depending upon the thickness and coloring of the specimen. The developing and printing of the plates was carried out in the usual way, requiring very little more skill than is required to develop and print an ordinary photographic plate.

I.

CYLINDROMA OF NOSE.

Sarcomata sometimes contain masses of hyaline substance which is produced by the cells; or the cells become converted into this material; or the connective tissue and blood vessels are changed into hyaline material. The hyaline masses, which are observed in a great variety of form, force apart the cells. In muroid and gelatinoid cancers the muroid and gelatinoid masses develop within the nests of cells and give rise to very much the same appearance as described above in the sarcomata. Such a tumor may be called a carcinoma cylindromatousum.

In the microphotograph we see in the center an enormous triangular space, filled with a hyaline mass (2) and practically devoid of cellular elements. Grouped around this central hyaline mass are seen numerous smaller oval and round hyaline collections surrounded by sarcoma cells (1). That the cells have been crowded apart by the hyaline formation can be readily seen.

II.

CYLINDROMA OF NOSE.

In this picture, from the same specimen, are numerous irregularly shaped cylindromatous spaces. In this view one sees several small cylindromatous areas just forming. As in No. I, the sarcoma cells (2) are clearly visible.

III.

ANGIOMATOUS POLYP FROM SEPTUM.

Bleeding polypi of the septum usually spring from the mucosa of the cartilaginous septum, and are of rather frequent occurrence. The explanation of their frequent occurrence on the septum is the vascularity of that area which is known as the locus Kiesselbachi. The formation of the growth is

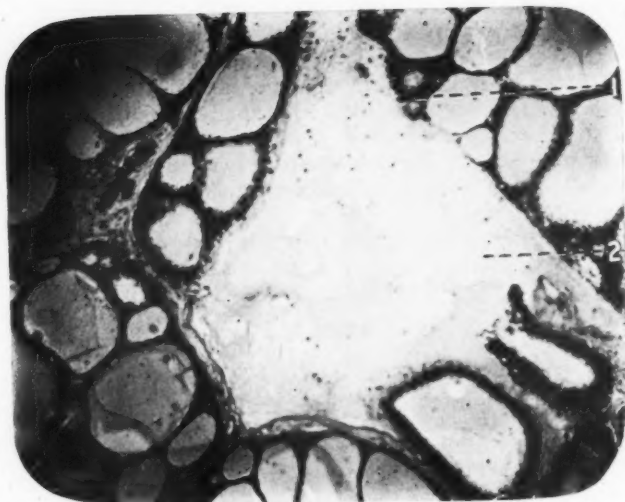


FIGURE 1.

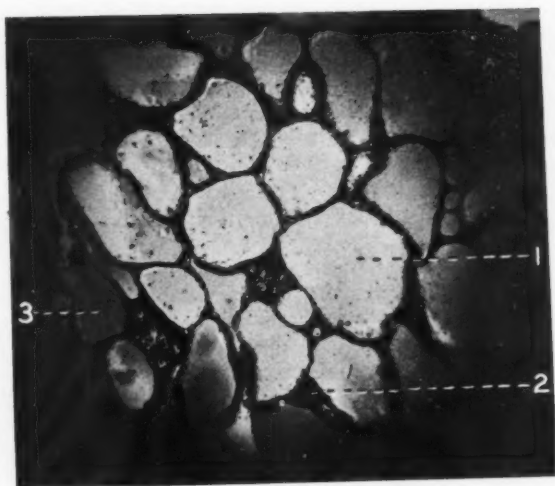


FIGURE 2.

made possible by a thinning of the mucosa with loss of elastic fibers; this permits of a proliferation and dilatation of blood vessels. This condition of the mucosa is probably the result of an inflammatory process. In the microphotograph are seen numerous, but for the most part comparatively small, blood vessels (3) lined with a single walled endothelium and showing no muscular coat. The blood vessels lie in a stroma of myxofibromatous tissue (2) containing many leucocytes (4). The epithelial covering (1) of the polyp is of the pseudo-stratified columnar variety.

IV.

CHONDROMA OF NOSE.

There is a difference of opinion among rhinologists as to the existence of a truly benign chondroma of the nose. It is probable that most of the cases reported as nasal chondroma are either *echondromata* (local hyperplasias of the septal cartilage) or *chondrosarcomata*. The writer believes that the specimen from which this microphotograph was made is one of benign chondroma of the nose, as there was no report of recurrence, and the growth was not the simple hyperplasia of the septal cartilage so frequently observed. A chondroma consists chiefly of cartilage. The amount of connective tissue found in its structure, covering its surface or penetrating its interior as a framework, is so slight that one almost fails to see it in many specimens. The usual tissue of a chondroma is hyaline cartilage; less frequently it is found to be composed of fibrocartilage.

The number, size, form and arrangement of the cells vary greatly in different tumors. Some contain many cells, others few; some have small cells and others large; others contain both large and small cells. The cells may have capsules or may not have; in some specimens they are seen to lie in groups surrounded by a capsule; in other cases the individual cells are found apart, but arranged in a regular manner. All varieties of cartilage which exist normally may be found in tumors; accordingly, cells of different forms are observed; the majority, however, are usually the round form. Commonly

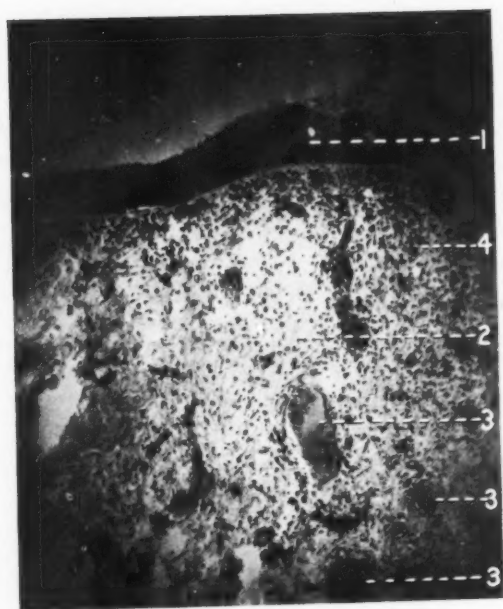


FIGURE 3.

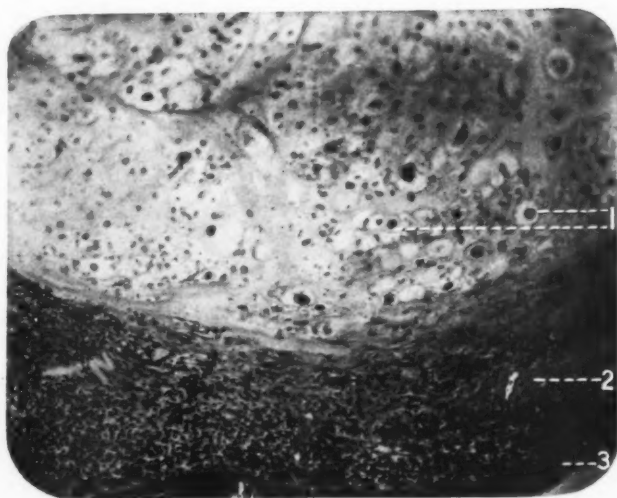


FIGURE 4.

spindle and star-shaped cells are found in the neighborhood of the connective tissue bands which separate the tumor into lobules or surround it as a whole. Retrograde metamorphoses are often observed in the chondromata. Fat drops are often seen in the cells. A mucoid degeneration of the basic substance is sometimes observed; this results in either the formation of mucous tissue, giving rise to a chondromyxoma, or the intercellular substance undergoes complete liquefaction and the cells are destroyed, in which case cysts are formed. In some cases the cartilage undergoes calcification, or genuine bone may be formed. In such cases we designate the tumor as osteochondroma. Excessive proliferation of the cells of the cartilage may result in the formation of sarcomatous tissue; then the neoplasm becomes a chondrosarcoma.

In the microphotograph presented we note all sizes and forms of cartilage cells, which are arranged in groups, each of which is surrounded by a capsule. Around several groups is another capsule continuous with the capsule which extends around the entire cartilaginous mass. Fat drops are seen here and there. The subepithelial tissue shows a marked infiltration with round cells (2). At the lower limit of the picture may be seen the epithelial covering (3) of the tumor.

V.

METASTATIC CARCINOMA OF THYROID IN NOSE.

There is little necessary, here, in the way of description; the picture speaks for itself. We see innumerable carcinoma cells arranged in groups or plugs, surrounded by a connective tissue stroma.

VI.

In this picture we have a higher magnification of No. V.

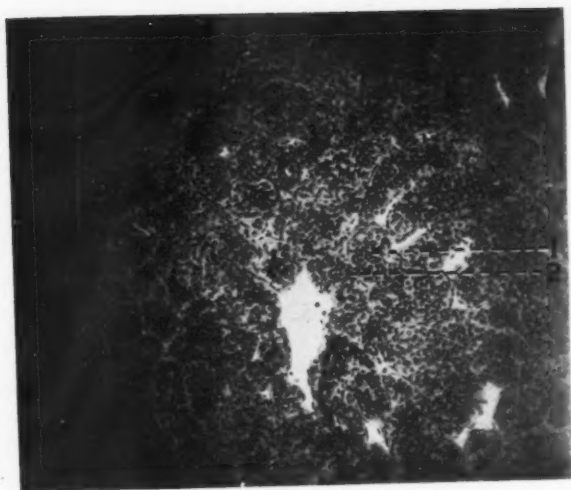


FIGURE 5.



FIGURE 6.

VII.

MUCOUS CARCINOMA OF NOSE.

Mucoid cancer or gelatinoid cancer owes its peculiar characteristics to the fact that the epithelial cells produce a mucus-like substance. The mucus production may begin during the earliest development of the growth. The material collects in the center of the cell nests, like the secretion of a gland. The cells which surround the mucoid material are later broken through, with the result that the cells are loosened from their support and crowded together. Ultimately the epithelial cells are entirely destroyed, and we have a condition resembling the cylindromata, a condition which may be classified with the corresponding sarcomata. One may speak of mucous carcinoma at this stage as a carcinoma cylindromatosum. It is probably better, however, to retain the original nomenclature of mucous carcinoma.

In the microphotograph of a section from a mucous carcinoma of the nose, we are first interested in the large white area (1) on the right, which shows an advanced transformation of carcinomatous tissue into mucoid substance. Remains of epithelial cells are still seen suspended in the mucoid material. On the left may be seen an area (3) in which an earlier stage of the process is depicted. Here can be seen how the carcinoma cells are being separated by the collection of mucus. In other parts of the picture are to be seen nests of cells (6) which have not yet been affected by the collection of mucoid material. On the left is a large projecting carcinomatous mass (4) showing ulceration. Two varieties of epithelium are seen in the picture: above, pseudostratified ciliated epithelium (2); below, stratified squamous epithelium (5).

VIII.

This picture is an enlargement of the projecting carcinomatous mass in No. VII. At (1) are numerous carcinoma cells with practically no mucoid material around them. In the center of the picture is seen a large collection of mucus (2) which has separated the cells in that area; practically the entire projecting mass shows ulceration.

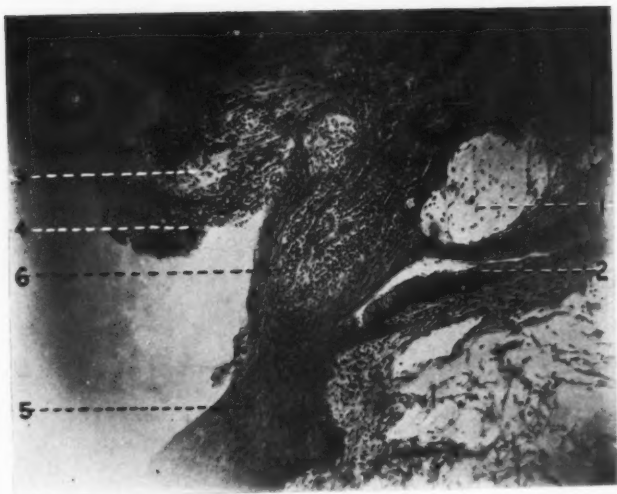


FIGURE 7.

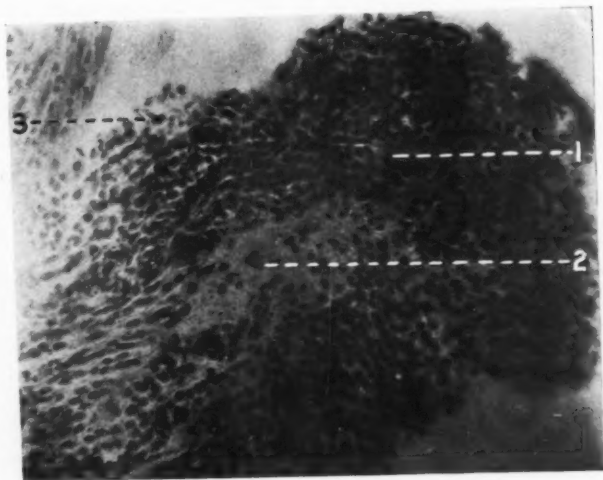


FIGURE 8.

IX.

MELANOSARCOMA OF NOSE.

A sarcoma is a connective tissue tumor in which the cellular elements are much more prominent than the intercellular substance. The sarcomata are closely related to undeveloped connective tissue. Sarcomata develop either in previously normal tissue, or in a connective tissue tumor. The transformation of the original tissue into the tissue of the neoplasm takes place by growth and multiplication of the existing cells. To consider the numerous types of sarcomata even briefly would result in a monograph beyond the object of this paper. A brief description of the type of sarcoma presented must suffice.

Melanosarcomata are developed in tissues which contain pigmented connective tissue cells—chromatophores. Metastases are common.

The microphotograph presented is of a specimen of metastatic melanomasarcoma of the nose. Throughout the picture can be seen the pigment (2) which in the specimen is yellowish brown in color. The sarcoma cells are chiefly of the small round variety. There is some evidence in the right upper part of the picture of alveolar formation. In the remainder of the picture the sarcoma cells (1) show no regular arrangement.

X.

In this picture we have another field from the same specimen. Pigment is here much less in evidence. On the right is an area of ulceration (3). The alveolar arrangement of the sarcoma cells (1) is more manifest than in No. IX. In this field are seen, with a few exceptions, only small round cells.

In the lower portion of the microphotograph may be seen stratified squamous epithelium (2).

XI.

DERMOID CYST OF MOUTH.

The occurrence of tissue formations in localities where such formations are not normally met with can be explained by the assumption of embryonic misplacement of cells.



FIGURE 9.

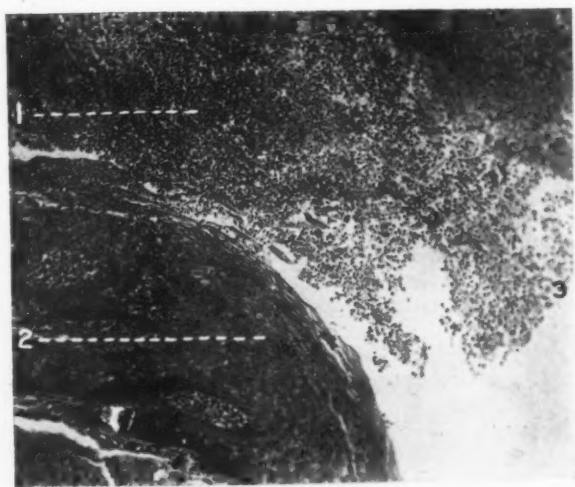


FIGURE 10.

Teratoid cysts may be divided into two chief groups: the ectodermal epithelial cysts on the one hand, and the entodermal and mesodermal epithelial cysts on the other. The ectodermal cysts vary in size from a centimeter in circumference to the size of a large fist. Their walls show ectodermal characteristics. The sac may consist of connective tissue lined with stratified flat epithelium. Such cysts are called epidermoids. The sac in other cases may present the characteristics of true skin: that is, it may show papillæ like those of the skin, with sebaceous glands, hair follicles, hair, sweat glands, and sometimes subcutaneous fat. These formations are called dermoid cysts.

The contents of such cysts are composed of either desquamated squamous epithelial cells alone or with fat and hair.

In the microphotograph presented we note superiorly the cavity (1) of the cyst. On the right, in the cyst cavity, is a mass of desquamated epithelium (2). Most of the contents of the cyst were lost during the preparation of the specimen. The sac is lined with stratified squamous epithelium (3) showing hornification. Three large papillæ extend toward the cavity of the cyst. In the particular field presented the sac shows little more than a dense connective tissue formation beneath the epidermal lining.

XII.

ANGIOFIBROMA OF GUMS.

We designate as angiomata those new growths in the structure of which blood vessels or lymph vessels constitute such an important part as to determine the character of the tumor.

A fibroma is a growth composed of connective tissue.

In the microphotograph presented we see a connective tissue new growth containing many newly formed blood vessels: hence the name angiofibroma. The most prominent element in the specimen is the mass of dense connective tissue (3) showing a moderate leucocytic infiltration (1). Throughout the picture may be seen numerous blood vessels (2) of different size. These vessels, with a few exceptions, are surrounded by a dense wall of fibrous tissue which is darker than the surrounding connective tissue.

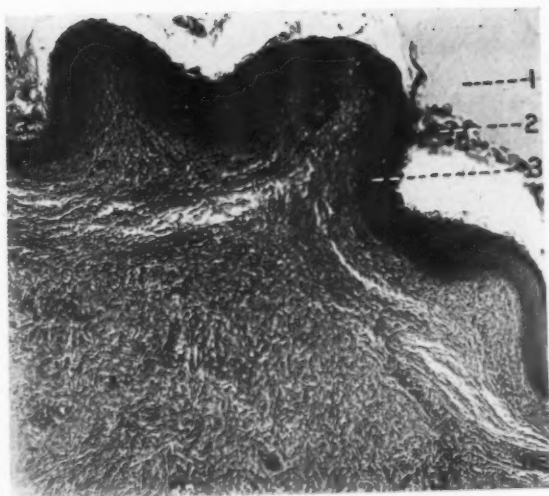


FIGURE 11.

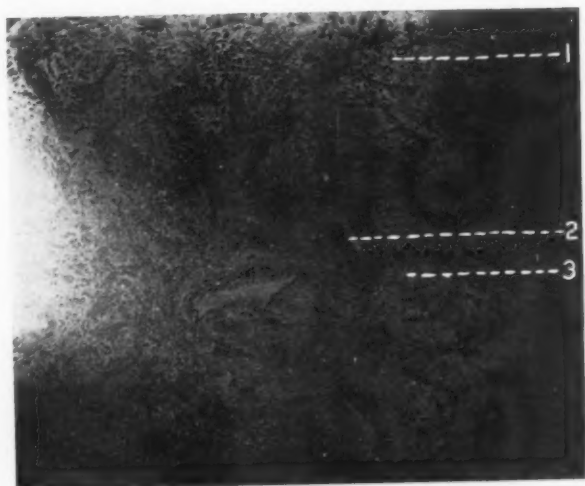


FIGURE 12.

XIII.

DIPHTHERIA PHARYNX.

In diphtheritic inflammation the greatest sufferers are the epithelial cells. A direct division of the nuclei occurs first; following this, necrosis. Finally, the epithelial cells become part of the false membrane which is formed on the surface. Marked leucocytic infiltration occurs, both in the subepithelial tissues and in the epithelial layer itself. The gland epithelium shows the same changes. Complete disintegration of some of the glands is at times observed. Exudation from the blood vessels in the subepithelial tissues results in an infiltration of the epithelial layers with a separation, in places, of the epithelium from the underlying supporting tissue. This separation results in the formation of vesicles. The deposit of fibrin results in the formation of the false membrane and in the subepithelial tissues, in the filling and compression of lymph spaces. In addition to fibrin the false membrane is composed chiefly of leucocytes, red blood corpuscles, and cellular debris. The blood vessels and lymph spaces are dilated. Muscle fibers become swollen and indistinct, and frequently show degenerative changes. Ulceration does not occur, as a rule, except in the larynx, as a result of prolonged intubation. After the separation of the membrane, repair takes place rapidly through the growth of epithelium from sound epithelial rests. Subepithelial regeneration occurs after the products of degenerative changes have been absorbed.

The microphotograph presented was taken from a specimen of diphtheria of the pharynx. Superiorly is to be seen the false membrane (1) infiltrated with leucocytes, red cells, etc. Several areas in which separation of the membrane (5) is occurring are to be seen. Immediately underlying the false membrane is an intense leucocytic infiltration (4), which is seen to extend directly through into the exudate above. In places remains of epithelium (2) are present. Necrosis of epithelium (3) can be seen in many areas. Beneath the muscle fibers (7) which are infiltrated with leucocytes, etc., and indistinct from degenerative changes, one notes many markedly engorged blood vessels (6). It is very interesting to examine these blood vessels closely for the exudation which was occurring at the time of death. In the lower portion of the picture one sees evidence of advanced degenerative changes in the glands (8).



FIGURE 13.

XIV.

LYMPHOSARCOMA OF TONSIL.

Sarcomata and epitheliomata are both met with in the pharynx. The commonest form of sarcoma in this region is the lymphosarcoma, or small round cell sarcoma which frequently has its origin in the tonsils. Less frequently the sarcomatous cells are spindle shaped.

The lymphosarcomata imitate in structure the lymphatic glands. The stroma which holds together large numbers of round cells is composed of a vascular reticulum, a part of which is made up of branching and anastomosing cells. Depending upon the development of the reticulum, the lymphosarcomata may be divided into two forms: the soft and the hard. In the hard variety the reticular framework may present a close resemblance to ordinary connective tissue.

In the microphotograph one sees on the right a lymph follicle (1) resembling very closely a normal tonsillar follicle. Upon closer observation, however, changes indicating the new growth will be noted.

These changes are chiefly in the grouping of the cells and the presence of a lymphosarcomatous reticulum. On the left in the picture is a mass of sarcomatous cells, both of the small round and the spindle shaped varieties.

XV.

CHRONIC LARYNGITIS.

The most important changes in the larynx resulting from a chronic inflammatory process are metaplasia and hyperplasia of the epithelium, increase in the fibrous elements, and sub-epithelial cellular infiltration. The epithelial hyperplasia is often very marked, especially in the posterior commissure: such a condition is known as pachydermia.

In the accompanying microphotograph one notes not only a metaplasia of epithelium into stratified flat cells, but a marked hyperplasia with hornification upon the surface. In the sub-epithelial tissues there is a marked fibrous tissue hyperplasia and a widespread round cell infiltration.

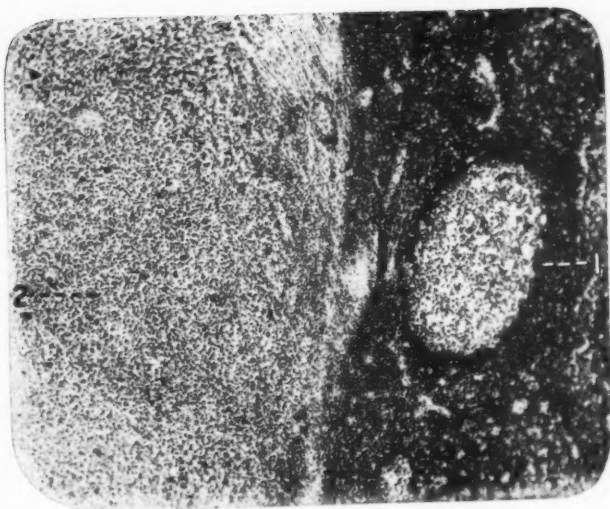


FIGURE 14.

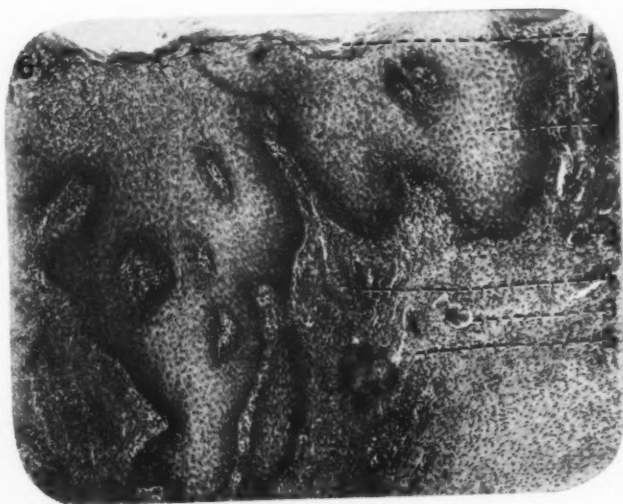


FIGURE 15.

XVI.

CYLINDROMA OF LARYNX.

As a detailed account of the formation of cylindromata has already been given in this paper in connection with another specimen, the writer will at this place simply describe the accompanying microphotograph. Three large cylindromatous spaces (1), filled with a hyaline mass (2), with some cellular elements scattered about, are seen with several smaller spaces above and below. Throughout the specimen are seen large masses of fibrous tissue (3) separating groups of sarcoma cells (4) and extending around the cylindromatous areas.

XVII.

LYMPHATIC LEUKEMIA LARYNX.

In lymphatic leukemia we may have in the larynx either a circumscribed or a diffuse lymphocytic infiltration. In the first picture of this condition we see on the left more or less circumscribed subepithelial infiltration (4). The stratified columnar ciliated epithelium (1) shows no change in structure and no infiltration. In the lower portion of the picture are mucous glands (2). Between the glands will be noted an intense lymphocytic infiltration (3). On the right is an area of edema (5) practically free of cellular infiltration.

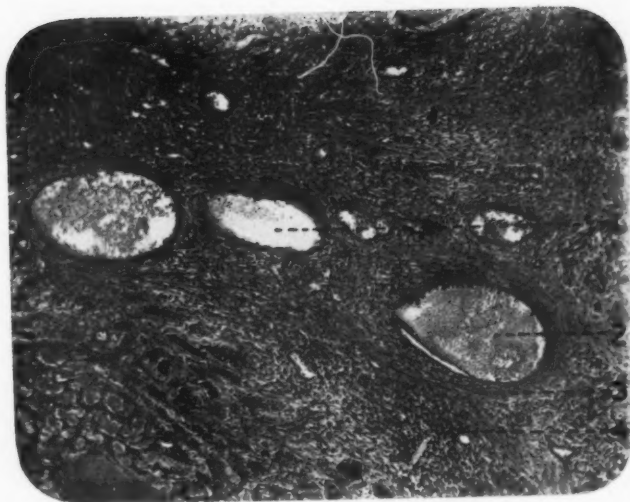


FIGURE 16.

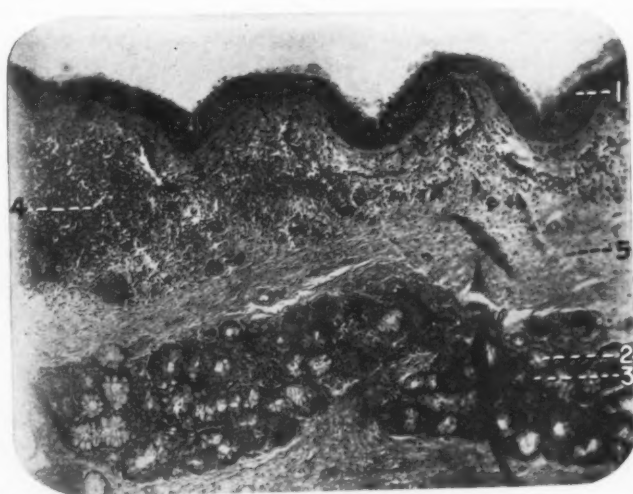


FIGURE 17.

XVIII.

LYMPHATIC LEUKEMIA LARYNX.

In this microphotograph one notes a diffuse subepithelial lymphocytic infiltration (2) and a metaplasia of epithelium (1).

XIX.

LYMPHATIC LEUKEMIA LARYNX.

Again in this picture one sees a diffuse subepithelial lymphocytic infiltration (3). Although the infiltration does not extend into the epithelium, excepting a few scattered cells, one notes in certain of the papillæ (1) as intense an infiltration as in the deeper tissues. Metaplasia of epithelium (4) is again noticed in this picture. Throughout the specimen are newly formed blood vessels (5).

XX.

CYST OF CORD.

Cysts in the larynx region are seen on the anterior surface of the epiglottis, on the cords, or on the lateral walls. Glandular cysts are rare. They result from a dilatation of gland acini

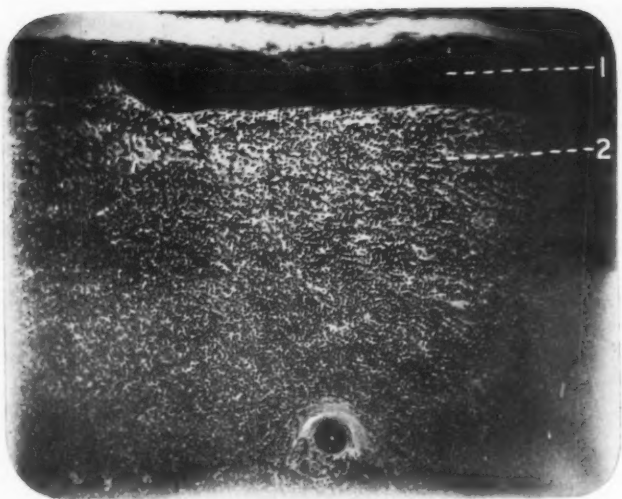


FIGURE 18.

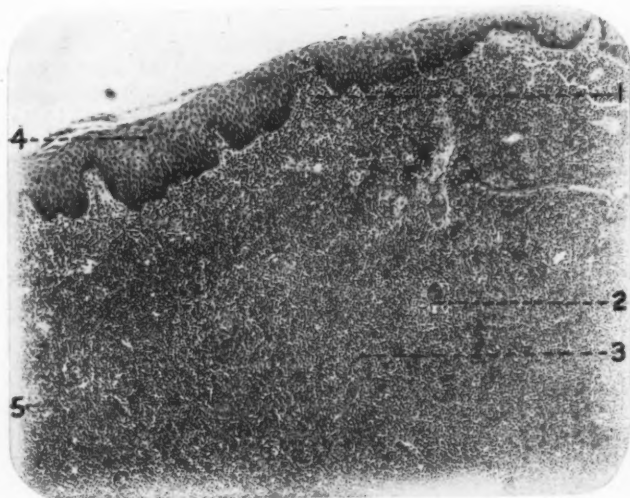


FIGURE 19.

or ducts, and are lined with glandular epithelium. After prolonged pressure the epithelial lining may be so altered as to be hardly recognized, or the original lining may be replaced by fibrous tissue. Another form of cyst occurring in this region is the connective tissue cyst. This may result either from a localized effusion of serum between the epithelium and underlying tissues, or to an effusion of serum into the subepithelial structures. Such cysts contain fibrous bands, hence the name.

The microphotograph presented shows a glandular cyst of the cord. The lining epithelium (3) has been flattened by prolonged pressure. The cavity of the cyst (1) is below and to the right. Remains of the cystic content (2) may be seen in the lower right hand corner of the picture.

XXI.

DIFFUSE CONGENITAL PAPILLOMA OF LARYNX.

Papillomata are primarily the result of epithelial hyperplasia. They consist of epithelial projections growing from a base of epithelial proliferation which has also resulted in the sending out of prolongations into the subepithelial tissues. The type of cell on the surface is usually that of the pavement variety. When springing from a part of the mucosa covered with columnar epithelium the cells, especially below the surface of the papillomatous projection, may resemble the type of epithelium from which they have grown. Each projection consists of layers of epithelium, with blood vessels and connective tissue in the center.

In the microphotograph one observes laryngeal tissue in the lower portion of picture. Upon the surface of this tissue are both stratified columnar (4) and flat epithelium. Subepithelially are glands (5). In the upper portion of the picture is the papillomatous tissue in which may be seen blood vessels (1), connective tissue (2), and the epithelium (6) of the papillomatous projections. Cross sections of the projections are seen on the right. Unfortunately the picture does not show the papillomatous projections springing from the laryngeal tissue.



FIGURE 20.



FIGURE 21.

VI.

THE TONSILS AS AN ATRIUM OF INFECTION IN POLIOMYELITIS.

BY ERNEST M. SEYDELL, M. D.,

WICHITA.

The recent reports of Mathers, Nuzum, and Rosenow on the etiology of anterior poliomyelitis which seem to show definitely that the organism is not a filterable ultramicroscopic virus, as previously considered by Landsteiner and Lavaditi, and Flexner and Lewis, but very probably a micrococcus, have opened some new avenues for investigation. Since it has been shown that in a number of cases the same organism found in the spinal fluid and tissues of the brain and cord has also been found in the tonsils of these same cases, it naturally makes one ask the question: Are these the portals of infection? Anterior poliomyelitis is an infectious disease accompanied in a certain proportion of cases by paralysis. The percentage of cases in which paralysis occurs is a great deal lower than has been previously believed—perhaps one in four.

BACTERIOLOGY.

In 1905, Geirsvold,¹ in a preliminary communication, stated that he had successfully isolated from the cerebrospinal fluid in twelve acute cases of poliomyelitis a Gram positive coccus, occurring in pairs, short chains and tetrads. He stated that he was able to make cultures of this microorganism on a variety of mediums; and further, he was able to produce definite paralysis in white mice, rabbits and pigeons. Landsteiner and Poppen,² and, working independently, Flexner³ and Lewis determined that the virus of poliomyelitis passes through a Berkfeld filter, and were able to produce a disease in the monkey which, in its clinical, pathologic and histologic features, was quite similar to acute poliomyelitis in man. They were unable

to produce the disease in mice, rats, guinea pigs, dogs, cats, goats, sheep or horses. In 1913, Flexner and Noguchi⁴ cultivated and demonstrated, microscopically, a small filterable microorganism with which they produced poliomyelitis in monkeys. The cultural conditions were similar to the bacteria, but they did not classify the microorganism—rather inclining to the view that the disease was caused by a virus. In September of this year Mathers⁵ published a report in which he stated that he had isolated a Gram positive micrococcus from the brain and cord of fatal cases occurring in the Chicago epidemic. He obtained these organisms in six out of seven cases examined. He did not obtain the micrococcus from the spinal fluid or heart blood. In closing, he stated that in view of the accepted fact in regard to the filterable virus of epidemic poliomyelitis, it would seem most reasonable to regard the micrococcus as a secondary invader. A short time after this Nuzum⁶ and Rosenow,⁷ working independently, Nuzum in Chicago, Rosenow in New York, published the results of their observations, both having undoubtedly discovered the same organism. Nuzum found the organism in each of the twelve cases examined by him. The micrococcus was obtained from the brain and cord at necropsy. He also reported the finding of this same micrococcus in the spinal fluid during life in eight out of nine cases examined. Since then these examinations have been extended, and in a subsequent report,⁸ he adds that he has found the same organism in forty-five out of fifty cases, or in ninety per cent. Twice he cultivated the micrococcus from the heart blood of the patient during life. The organism has been found in the spinal fluid twenty-four hours after the onset of the disease, and may still be found there two months after the patient has apparently recovered. Rosenow first, and later Nuzum, demonstrated these organisms in the tonsils of patients suffering with poliomyelitis. The former also found them in the ventricular fluid after death, from the blood during life in one instance, but not from the spinal fluid. He also isolated the organism from the brain and cord in each of twelve cases examined. The micrococcus is polymorphous—it appears in a minute form on anaerobic cultivation, and readily grows out into a larger form when cultivated aerobically.

They usually are found in short chains and clumps, and also in diplococcus arrangement. The smaller forms can be passed through a Berkfeld filter, and the subsequent cultures show both the large and small forms of the organism.

ANIMAL EXPERIMENTS.

In 1913, Flexner and Noguchi produced poliomyelitis in monkeys with their filterable virus. Rosenow produced paralysis with lesions in the central nervous system in guinea pigs, rabbits, dogs, cats and monkeys by intravenous and intracerebral injections. He produced the same lesions by injecting emulsions of pus expressed from the tonsils, also emulsions of the extirpated tonsils and brain tissues. Nuzum made cultures from the tonsil crypts of eleven cases of acute poliomyelitis and from eight pairs of tonsils removed from patients suffering with the same disease;⁹ and from all of the above, with the exception of two cases, the same peculiar Gram positive microorganism was isolated repeatedly, not in pure culture as a rule, however. With these cultures he produced paralysis, etc., in fourteen out of seventeen rabbits inoculated. In one *Macacus Rhesus* monkey and one small ring tail monkey injected with the tonsil cultures, there have been no results to date. Positive results were obtained in rabbits with cultures from the nasal discharge of two cases, from emulsions of brain tissue in two others, and also in one case using mesenteric lymph gland emulsions. The monkeys developed the typical lesions when injected with cultures obtained from the spinal fluid. The rule that the younger animals are more susceptible to inoculation holds true as it does in the human race. It may be said that the incubation period varies from thirty hours to fourteen days, also that the picture produced in the monkey is typical of acute poliomyelitis, both clinically and pathologically. In young rabbits there is a variation in the microscopic picture, although many of the changes attendant on the disease in man and monkeys are present in the central nervous system after paralysis.

THE ATRIUM OF THE INFECTION.

Now arises the question, where do these germs enter the system? I might say that it is impossible to definitely answer

this most important query at this time, but I believe, from the evidence already accumulated, that the tonsils play an important rôle in this direction. It has been the supposition for a number of years that the infection is disseminated from the nasopharynx of the diseased to the nasopharynx of the unfortunate victim. In America, Sohler Bryant,¹⁰ Stephens,¹¹ Anderson and Frost, as quoted by Bryant, Sheffield,¹² and others state that in many cases acute poliomyelitis is preceded or accompanied by nasopharyngeal inflammation, and suggest that many cases presenting a nasopharyngitis during an epidemic may be an abortive type of this disease. Experimental work should now be undertaken to prove the truth of these assertions. Rosenow¹³ states that the tonsils in patients suffering with poliomyelitis, especially those over three or four years of age, yield on pressure a surprisingly large amount of infectious material even where no objective symptoms of tonsillitis are present. These tonsils present numerous areas of localized necrosis, usually along the capsule and not communicating with the surface. They contain a peculiar opalescent material in which are found large numbers of the micrococci. These have also been found in the adenoids. In approximately twenty-five cases of infantile paralysis in which the temperature remained high and the paralysis was progressing, tonsillectomy was performed. No deleterious effects were observed in any of these cases; on the contrary, it was found that following tonsillectomy the temperature abated and convalescence was rapid. The results were so striking in some of the above cases that Dr. Rosenow suggests the advisability of removing the tonsils in this type of cases. The next question which naturally arises at this place is: How many of these cases that have had poliomyelitis have previously had their tonsils removed? To help determine this important question Dr. Meyer and the writer have carefully analyzed the histories of over two hundred cases which were treated at the Cook County Hospital during the recent epidemic. Our findings may be tabulated as follows:

Total number of cases studied, two hundred and three.

Average age, four years.

Oldest patient suffering with the disease was fifty years of age.

Youngest patient was six weeks old.

Deaths in this series numbered ten, or five per cent.

Average age of fatal cases was four and one-half years.

Oldest patient to die was twenty-six years.

Youngest, ten months.

In this number twenty-one cases, or ten per cent, had some cervical adenopathy.

Fifteen cases, or seven and one-half per cent, had an angina as an initial symptom.

Ten cases, or five per cent, had some discharge from the nose.

I might state that the Chicago Board of Health figured the mortality at twenty-one per cent. This was reduced in this series by the fact that some of the cases diagnosed as poliomyelitis proved to be tubercular meningitis or brain tumor at postmortem. In the two hundred and three cases whose histories we examined, we find that in the majority of the cases the tonsils were recorded as small. In a very much smaller number they were stated to be enlarged and slightly congested. In two cases one tonsil had been removed, and in one other a tonsillectomy had supposedly been performed. Upon examination, however, I found some tonsil tissue on the right side which contained a large crypt, and also found an adenoid. In these cases where a portion of the tonsil tissue had been removed the paralysis was slight and the convalescence rapid. In a communication from Dr. Rosenow on this subject he states: "I know of two cases that have developed poliomyelitis in whom tonsils and adenoids were presumably properly removed. In one, there was only a slight weakness of the shoulder muscles, which disappeared promptly. In the other case the paralysis was slight, even though a brother of the patient, whose tonsils had not been removed, was severely paralyzed. I have seen these two cases, and have heard of a few others, and I believe in all cases the paralysis was not marked."

CONCLUSION.

A review of the findings of the Chicago epidemic do not lead one to believe that many of the cases had a nasopharyn-

gitis, neither as an initial symptom or later in the disease. It must be remembered, however, that many of these cases were brought into the hospital with the disease well advanced, and it was sometimes very difficult to obtain any definite history. In this epidemic the organism did not produce cervical adenopathy; neither did it seem to produce apparent inflammation of the mucous membrane covering the tonsils, as in most instances in which abscesses were found the tonsils appeared normal.

Three investigators, working independently in widely separated cities, have recently isolated what appears to be the same peculiar microorganism from the tonsils, tonsil crypts, spinal fluid, brain and cord, and even from the heart blood and mesenteric lymph glands of cases of poliomyelitis. Their experimental reports indicate that the micrococcus has met all of the provisions of Koch's laws.

It has been known for a long time that the causative factors of poliomyelitis remain in the nasopharynx of the patient for as long as six months. Now we find that we can produce the disease in animals by injecting them with the contents of abscesses found in the tonsils of the affected patient. The disease attacks young children in a very high percentage of the cases, who, as we well know, have a tendency towards abnormal conditions of their lymphatic systems. One of the striking features of this disease is the elective affinities of this organism for the nervous system on the one hand, and for the lymphatic system on the other. The germs seem to travel to the central nervous system along the perineural lymph channels.

In the two hundred and three cases which we studied we find tonsils present in two hundred cases. In three cases there was a partial absence of these structures, and in these cases the paralyses were slight and recovery rapid. In the cases of Rosenow we find a similar course and result.

All of which very greatly strengthens our belief that the tonsils and adenoids are the portals of infection of this alarming disease.

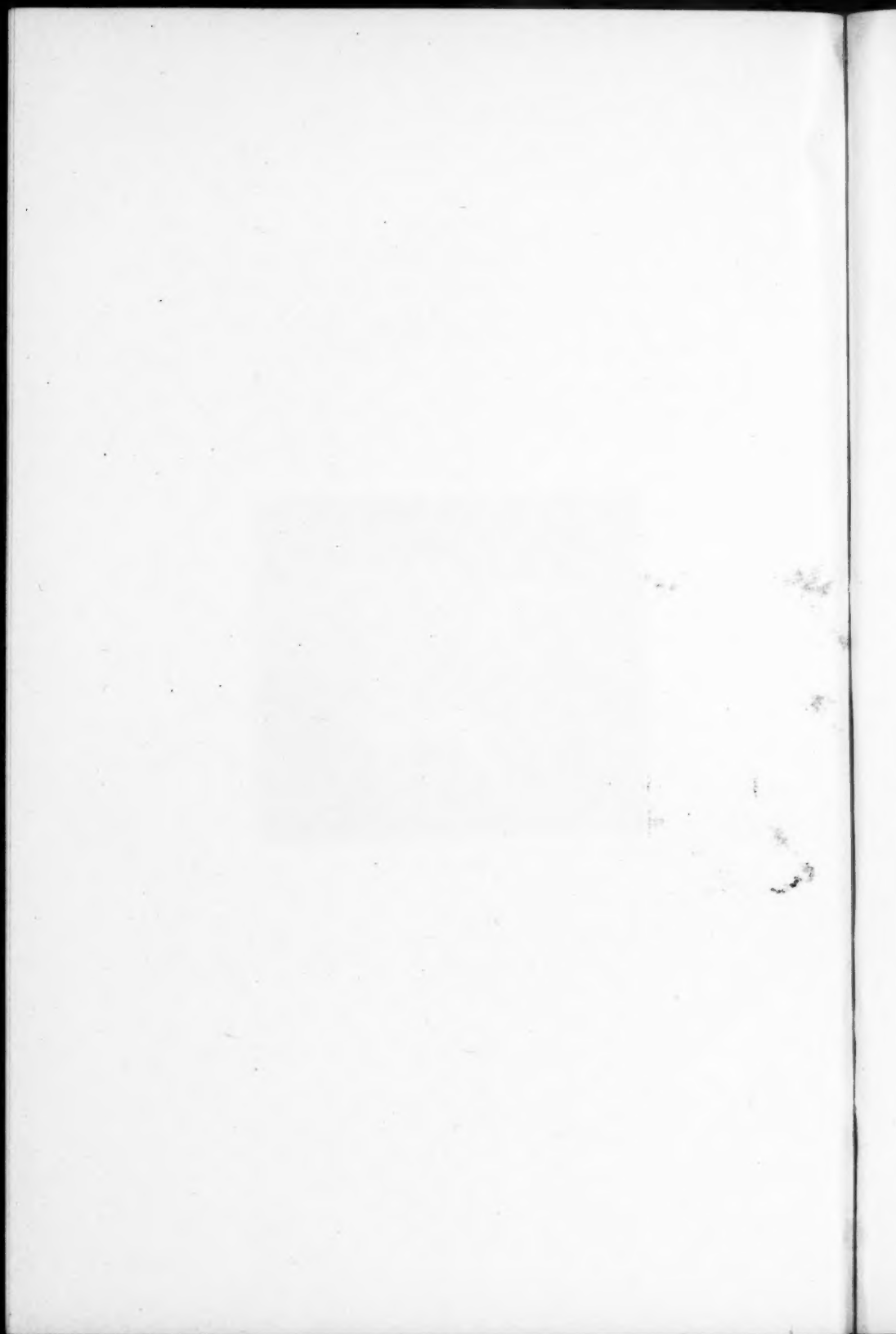
In closing, I wish to thank Dr. Nuzum and Dr. Meyer, who made it possible for me to publish the reports of the Cook County Hospital.

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FIGURE 1.



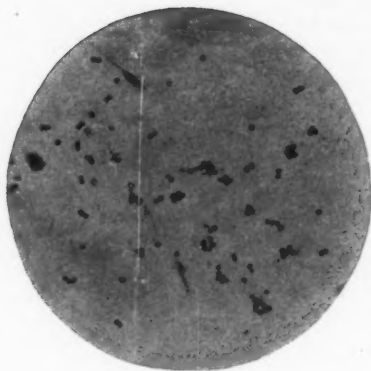


FIGURE 2.

Twenty-four-hour culture from the spinal fluid. Small variety.

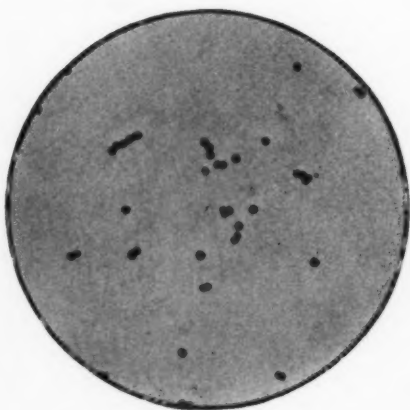


FIGURE 3.

Seventy-two-hour culture from the tonsil. Large variety.

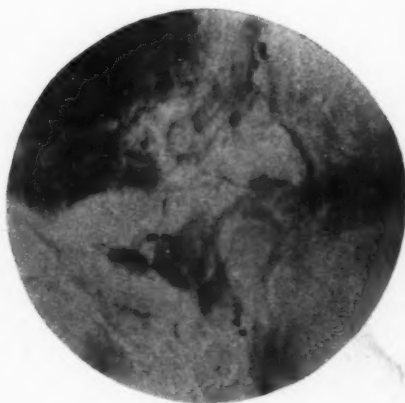
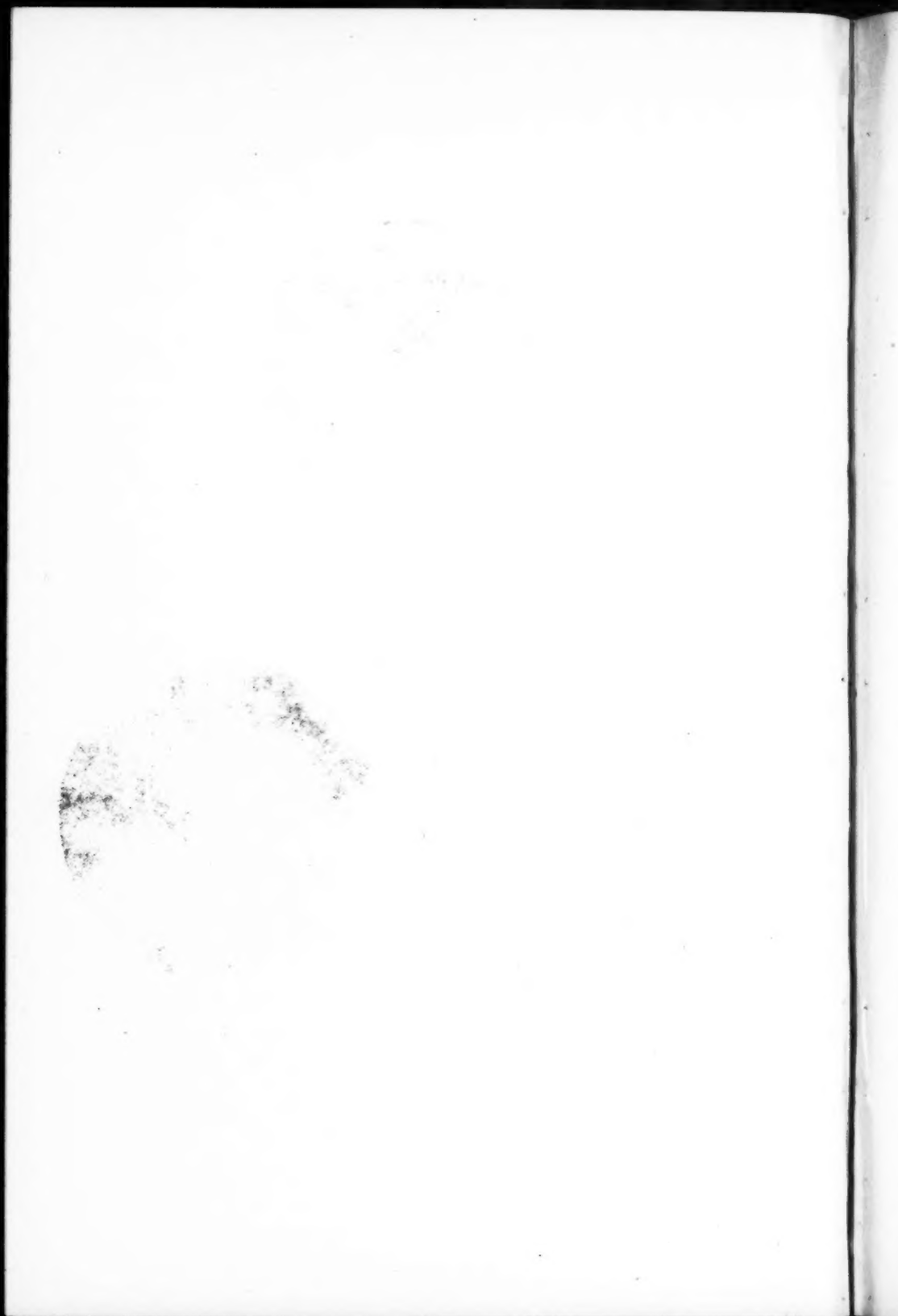


FIGURE 4.

Micrococci in nerve tissue.



VII.

TUBERCULAR MASTOIDITIS—RADICAL OPERATION UNDER COCAIN ANESTHESIA.*

BY HAROLD HAYS, M. D.,

NEW YORK.

About two years ago, Mr. S., aged twenty-four years, came to consult me about his deafness and sharp pain in the right ear. His history showed that he had had a tuberculosis of the lungs which at that time was in a quiescent state. He had had a radical mastoid operation performed on the left ear and mastoid four years before. This had never healed properly, with the result that there was a large opening into the dura which was constantly suppurating.

Examination of the right ear showed granulations in the middle ear, entire destruction of drum, and the discharge of cheesy-like pus. Culture from this ear and from the sinus behind the left ear showed numerous tubercle bacilli. He could hear neither watch nor tuning fork at either ear.

During that first winter I had him under observation two or three times a week, during which time I attempted every known means of clearing up the condition.

As he did not improve, I advised a radical mastoid operation.

The question of anesthesia was an important one. Here was a patient with a quiescent tuberculous process in his lungs, a patient whose general physical condition was far below par. Ether anesthesia per oram would possibly light up his lung condition, so I determined to operate upon him under local anesthesia.

On the day of the operation at ten o'clock in the morning he was given a hypodermic injection of morphin grain one-fourth, atropin grain one-one-hundredth. Two hours later a

*Read before the New York Academy of Medicine, Section on Otology, October 13, 1916.

second injection of like amount was given. At two o'clock he was brought to the operating room. As there were no signs of opium poisoning, another injection of morphin grain one-eighth was given. The operative field was prepared in the usual manner. A solution of equal parts of ten per cent cocain with equal parts of adrenalin having been prepared, an injection of this solution along the line of the proposed incision was made, going well into the surrounding tissues, forward to the lobe of the ear, upward to the zygoma, and backward to the occipital bone. An attempt was made to have the injections reach down to the periosteum. This is not a difficult matter in this region, as the tissues are not very thick.

The semilunar incision was made throughout its whole extent down to the periosteum. A longer needle was attached to the hypodermic syringe and an injection made under the periosteum of a one-half of one per cent cocain solution with equal parts of adrenalin (Shleich infiltration). Two to three drams of this solution were injected, care being taken that some of it reached the periosteum below the tip and anterior to the bony canal. It was spread through the tissues posteriorly and above until an area of at least three to four square inches was infiltrated.

The periosteum was then incised and scraped back with a rasp and the retractors were inserted.

After the bone was well exposed the mastoid cavity was uncapped with a chisel. The patient complained of no pain at any time while I was working in the mastoid cavity. The operation was a Schwartze-Stacke. The cavity was extremely large, the bone extremely hard, the tip entirely destroyed so that it had to be removed in its entirety. When the patient was asked to describe his sensations, he stated that he felt no pain, only the apprehension of pain, similar to what he would feel in the dentist's chair. We are wont to feel that in the mastoid operation under ether anesthesia, the constant chiseling and using of rongeurs produces a slight concussion of the brain, which accounts for the lessened amount of ether we have to give. After this experience I am inclined to think that this idea of ours is visionary. The constant pounding of the bone produced no marked change in the patient's mastoid condition. In fact, he did not seem to mind it at all.

The mastoid cavity was thoroughly cleaned out without any trouble. The bony canal wall and the bridge over the antrum were taken down without any pain. However, when the sensitive mucous membrane of the middle ear was reached, trouble commenced. It had been impossible thus far to cocaineize this membrane. Here was a mass of sensitive granulation tissue. In order to overcome this sensitiveness a four per cent cocain solution was injected along the posterior canal wall, into the granulations themselves and deep down into the eustachian tube. Not all sensitiveness could be overcome, but enough to proceed with the operation with little trouble. The mass of granulations were removed with a curette until I came to a thicker tougher mass, apparently attached to the internal wall of the middle ear. I hesitated to remove this, as I realized that the facial nerve was either in it or close by. But the mass was infected and had to be removed. I grasped it with forceps and snipped it off with a small scissors. At once the patient exclaimed: "Doctor, you must have hit my facial nerve. The right side of my face is paralyzed." Such was the fact.

The eustachian tube was curetted and a skin flap for a new canal made without any trouble. The making of the skin flap was facilitated by the lack of bleeding, due to the blocking off of the vessels by the cocain solution. When one realizes how much bleeding there usually is, he can appreciate of how much value this ischemia was. After making the artificial canal the posterior wound was closed with tendon sutures.

Three hours after the operation the patient sat up in bed to eat his supper. Having had a radical mastoid operation performed on the other side under ether anesthesia, he was in a position to make comparisons. He was most enthusiastically in favor of local anesthesia. Not only had the general reaction been severe at the time of the former operation, but his wound pained him a great deal. In this instance the pain was practically nil. At the end of the week he left the hospital with his wound in excellent condition. The facial paralysis began to improve, so apparently the nerve was not completely severed.

A few months ago I lost track of the patient. I had hoped to present him at this meeting. But I received a letter a short time ago stating that he had died at Bellevue Hospital during

the summer from a tubercular meningitis. Autopsy showed a direct extension of tuberculosis from the suppurating cavity behind the left ear to the dura.

The practical points to be deduced from this case are the following:

1. That the radical mastoid operation can be done under local anesthesia without any pain.
2. That the superficial scalp tissues and periosteum are sensitive, but that bone has absolutely no sensation.
3. That the mucosa of the middle ear is extremely sensitive and must be separately cocainized.
4. That irritation or destruction of the facial nerve is immediately noticeable to the patient.
5. That the after-effects are practically nil.
6. That the end result is just as good under local as general anesthesia.

VIII.

SALIVARY FISTULA FOLLOWING A SIMPLE MASTOIDECTOMY WITH CERVICAL ABSCESS.

BY FREDERICK C. SCHREIBER, M. D.,

WASHINGTON, D. C.

Of the very many postoperative sequelæ following a simple mastoidectomy, that of a salivary fistula is one of the most rare, and paralysis of the facial nerve a much more frequent complication. It is quite natural, then, that a case incorporating these two conditions should be regarded as unique. More particularly is this true when it is understood that both entities were sustained by a common and remarkable injury to the lower lobe of the parotid gland. The case I am to present this evening entered the New York Eye and Ear Infirmary, on the service of Dr. Lewis, with the following history supplied by the mother:

L. S., female, aged seven years, with negative family history, was operated on five years ago for an acute mastoid abscess with cervical abscess. She had suffered with a cold for ten days prior to the onset of a double acute otitis. Three days later a large swelling appeared in the upper left cervical region. The child was taken to a dispensary, where immediate operation was advised. Two weeks after the operation the child was dismissed, and in three weeks more the mastoid had completely healed with the exception of the fistula still existent. Unfortunately, these facts could not be corroborated by the hospital to which credit for the operation was given.

Examination of the patient's operated ear discloses evidence of a straight incision, fairly well back from the auricle. The lower part of the incision is carried downwards and forwards to just below the angle of the jaw. The incision is completely healed with the exception of a minute point, which can be seen at the angle of the jaw periodically discharging a slightly turbid, colorless fluid. The fluid increases with

mastication and deglutition, although it is not as dependent on the latter as the former. Articles of food not designed to excite salivary secretion are not accompanied by a profuse discharge from the fistula opening.

Examination of the fluid showed it to be a somewhat turbid, colorless and odorless secretion, with a tendency to viscosity. It was slightly alkaline to litmus, and showed nothing of importance microscopically. Psychic influences governed the rate of flow considerably. In a strange environment the flow was completely arrested, only to be reestablished by mechanical or chemical means. Of the methods used to promote a free flow, one above all the rest proved most satisfactory, that of chemical stimulation, employing citric and acetic acids, in the form of lemons and pickles.

The secretion was collected to determine its ability to split the polysaccharides into less complex sugars. With this in mind, a bit of starch was heated in a test tube of water to dissolve off the outer cellulose layer. Fehling's solution was used in the usual way to determine the presence of disaccharides. A control was made, adding starch paste to the Fehling's, whereupon no reduction of the copper salt was observed. A small amount of the secretion gathered was placed in a test tube filled with about ten cubic centimeters of the paste. An equal quantity of the patient's saliva was added to the same amount of paste, and a comparison was attempted. It was found that the secretion collected exerted a much more positive hydrolytic cleavage on the polysaccharide than the saliva. In shortly less than eight minutes a definite reaction for sugar was detected by Fehling's reagent.

No reaction resulted when a solution of ferric chloride was added to the secretion, to determine the presence of the sulphocyanides which are supposed to be constantly present in parotid secretion.

The biuret test for mucin was next attempted and, strange to say, a positive reaction was recorded. This, in the light of the fact that the parotid gland is a true serous gland, supposedly not secreting mucin, seems a bit contradictory, and the author is at a loss to explain the reaction, unless the submaxillary gland is also involved.

The next test was undertaken to prove or disprove the

communication of the fistulous tract with the pharynx. To this end it was decided to inject the tract with a solution of methylene blue or with bismuth paste, but the size of the punctum precluded such a possibility. Then the patient was instructed to gargle and later to swallow about four ounces of starch water. The fluid was collected for a period of fifteen minutes, but without success of a positive reaction to iodine.

The patient was then given six drops of a saturated solution of potassium iodide, with the idea of recovering some of the drug in the secretion. A solution of nitric and nitrous acids, to which an equal amount of starch paste was added, served as an indicator. The time of reaction was taken, and in twelve minutes a positive blue ring struck in the test tube, confirming the presence of the iodide in the fistulous fluid.

An attempt was made to probe the duct to determine its course. The finest Stenson's duct probe was employed, but it could only be passed to a distance of one-eighth to one-quarter of an inch, where its further progress was arrested.

Of the disease entities with which this condition could be confused, and from which it was necessary to differentiate, might be mentioned Potts' disease affecting the cervical vertebrae, with abscess formation discharging in the lateral cervical region, suppurative adenitis, and branchial fistula.

The thought of the first two disease entities, Pott's disease and suppurative adenitis, was dispersed by the result of the macroscopic, microscopic and chemical analyses of the secretion. However, the third condition seemed more probable: so plausible, in fact, that at first it was thought that the condition presenting was a branchial fistula.

To exclude the possibility of this, it became necessary to definitely prove that there was no communication with the pharynx. This would naturally presuppose that a blind external fistula had existed since birth, which had accidentally been opened into at the time of the operation, converting it into a complete pharyngocervical fistulous tract. The position of the opening, periodicity and nature of the discharge all argue in favor of a salivary fistula complicating a mastoidectomy. The diagnosis might even be further restricted to a parotid fistula affecting the parenchyma of the gland, with a remote

possibility of a submaxillary involvement, which is substantiated by the physiologic characteristics of the secretion and the associated paralysis of the lower cervicofacial branches of the seventh cranial nerve, both occasioned by faulty technic.

In conclusion, I wish very superficially to review the importance of the parotid gland. This gland should engage the attention of every otologist and rhinolaryngologist from a physiologic, pathologic and anatomic standpoint. Physiologically it plays the premier rôle of the paired salivary gland in secreting the ptyalin so necessary to the cleavage of the complex carbohydrates and in secreting a fluid very essential to moistening the bolus of food in order that it may stimulate the taste buds on the posterior part of the tongue. Pathologically this gland is of interest: First, because of the constitutional and reflex conditions which affect its secretory activity; second, because of the suppurative process, both circumscribed and phlegmonous, which may affect its integrity, and the relation it bears to Ludwig's angina; and third, because of the frequency of heterologous tumor formation within its substance, notably chondroma. It might be well to mention the clinical parallelism between acute circumscribed abscess formation pointing in the oropharynx to retropharyngeal abscess and abscesses pointing toward the external auditory canal to furuncular conditions, so prevalent in the cartilaginous portion of the meatus.

By far the most interesting and important feature of this gland is its anatomic position and the structure which it harbors. Extending, as it does, in front of the ear from the zygoma above to the lower border of the body of the mandible below, covering the posterior one-third of the masseter muscle, and extending backwards to the external auditory meatus, the mastoid process, sternomastoid muscle and the posterior belly of the digastric, it forms a most formidable structure constantly to be mindful of by the workers in this special branch of medicine. Add to this, then, the structures which pass through its substance, namely: (three nerves) facial, great auricular and auriculotemporal; (four veins) superficial, temporal, temporomaxillary with communicating branches to internal jugular; internal maxillary, postauricular, and one artery, external carotid, and its importance becomes even more manifest.

IX.

A CASE OF LABYRINTHINE FISTULA WITH COMPLETE LOSS OF COCHLEAR FUNCTION AND PERSISTENCE OF NORMAL VESTIBULAR FUNCTION.

BY JULIUS AUERBACH, M. D.,

NEW YORK.

This man is forty-three years of age, and gives a history of discharge from left ear since early childhood. For the past five or six years the ear has been practically dry, and aside from the impairment of hearing, he was in no way troubled until seven months ago, when he had a violent attack of dizziness accompanied with sensations of turning, nausea and vomiting, and disturbance of equilibrium; this lasted for a day, and was followed by another but less marked attack two weeks after the last attack.

Examination disclosed the following:

Right ear showed a normal drum membrane and normal hearing. In the left ear the drum membrane was entirely destroyed, the canal dry, and the inner wall of the tympanic cavity exposed and epidermized; the ossicles are gone; the eustachian tube is open.

Hearing tests with the Bárány noise apparatus showed total deafness to the loud conversation voice. Acoumeter not heard when held close to the ear. The Weber test showed lateralization to the nonaffected ear. The low middle and high forks not heard.

The Stenger test is negative, proving a complete unilateral deafness; the reading test, carried out with the noise apparatus, also shows complete deafness on that side.

Static Labyrinth.—Spontaneous nystagmus is absent.

(1) Turning Test.—Turning ten times to the right with closed glasses, in order to eliminate the error of optic nys-

tagmus, gives a nystagmus to the left lasting twenty seconds. Turning ten times to the left gives a nystagmus to the right lasting twenty-four seconds.

(2) Caloric Test.—In view of the otoscopic findings, this test with hot and cold water was not performed. I employed instead the Struycken apparatus with ethyl chlorid, and was able to elicit a nystagmus to the opposite side.

(3) Fistula or Mechanical Test.—Compression of air in the external auditory canal with a large olive closing the canal gives a typical nystagmus, with the quick component to the same side and a slow component to the opposite side. Aspiration reverses the nystagmus. The head motion is in the direction of the slow component.

I have said that the eustachian tube is open; when compression is carried out the patient feels a current of air in his throat; if the entrance of the eustachian tube into the tympanic cavity is closed by a pledget of cotton, much less compression is necessary to cause the same degree of nystagmus; or if the patient do a Valsalva at the same time that the test is carried out, a more violent nystagmus is elicited.

We have here then a case of complete unilateral deafness with preservation of the static labyrinth and the presence of a labyrinthine fistula, as is evidenced by the fistula test.

The cause of the complete deafness is not absolutely clear to me. Was it produced by a slow degenerative process of the cochlea nerve and the organ of Corti, or did the patient pass through a serous labyrinthitis at the time of his first violent attack of dizziness, with the consequent production of this total deafness?

Now as to the location of the fistula: *Fistulae* of the semi-circular canals have been found on the operating table where the previous fistula test proved negative. On the other hand, none has been found where the test proved positive.

The most favorable site for the formation of *fistulae* is in the horizontal or external semicircular canal, this being the most exposed to suppuration in the tympanic cavity and antrum, it being remembered that this canal lies partly in the antrum.

In view of the fact that the ear has been absolutely dry, that there was no spontaneous nystagmus and no dizziness, I

thought it advisable to keep him under observation. In the seven months that have elapsed he has attended to business, that of a shoe salesman, has not lost a day's work, and has been free from all symptoms.

The interesting features of this case are:

(1) The practically normal vestibular reaction, showing neither an increased nor a diminished static activity.

(2) Complete loss of cochlear function, indicating a widespread invasion of the labyrinth at some past period.

(3) Question of treatment. This patient was seen by several otologists, who advised a radical mastoid operation. Was this advice justified in the light of the findings?

(4) A dry ear with no spontaneous nystagmus, no dizziness, no loss of hearing seems to call for no operative interference.

(5) With a recurrent acute infection of the middle ear causing retention, dizziness, spontaneous nystagmus, and disturbance of equilibrium, a radical mastoid would be in order. In no case should a labyrinth operation be considered, unless intracranial complications were threatening or manifest.

THE READING TEST AS AN AID IN DIAGNOSIS OF COMPLETE UNILATERAL DEAFNESS.

This test is carried out with the aid of the Bárány noise apparatus as follows:

The patient is given something to read aloud in his usual conversational tone. With the noise apparatus inserted in the canal of the deaf ear, no impression is made on his reading voice; when, however, the apparatus is inserted in his good ear, his voice becomes louder and louder, compensating for the noise created by the apparatus, though the patient is unconscious of the fact that his voice is raised.

THE STENGER TEST TO DETERMINE COMPLETE UNILATERAL DEAFNESS, REAL AND SIMULATED.

This test is carried out with the aid of two equal tuning forks, preferably small A¹, and is dependent upon this phenomenon: that when both forks are sounded, the fork held close to the ear will completely obliterate the sound of the fork which is held farther from the ear. In complete deafness

this phenomenon is reversed; that is, the fork, although held close to the deaf ear, is not heard, while the fork held at a distance from the good ear is heard. In simulated deafness the examiner stands behind the patient and sounds both forks at the same time; taking, for example, that deafness in the left ear is simulated, the patient will not hear the fork on the right side when one tuning fork is sounded and held close to his left ear, showing that he does perceive sound on the left side.

X.

RESULTS IN FOUR CASES OF A MODIFIED RADICAL OPERATION FOR CHRONIC PURULENT OTITIS MEDIA.

BY HUGH B. BLACKWELL, M. D.,

NEW YORK.

The operative procedures performed in these four cases have been employed some nineteen times by me during the past three years. The purpose of the operations was to cause a cessation of the discharge, and at the same time to conserve or even improve the hearing.

The first patient, L. K., twenty-three years old, was admitted for operation to the Manhattan Eye, Ear and Throat Hospital six months ago, with a history of a discharging right ear for three years previous to admission. During all this time there was a more or less constant feeling of fullness or heaviness in the head. It was mainly to seek relief for this symptom that he came to the hospital.

Aural examination on admission revealed the presence of foul pus in the external auditory canal. Shrapnell's membrane was missing. By means of a large probe introduced through this opening, bare bone could be felt in the attic, and small portions of cholesteatoma were removed. The remainder of the drum membrane was intact. Weber was referred to the normal ear. With the Bárány noise apparatus in the normal ear, the patient was unable to hear the loudest shout in the affected ear. After injecting the affected ear with cold water for three minutes and forty seconds, a nystagmus reaction was produced. Rotation tests were normal.

Operation.—Modified radical. The cortex was very hard; there were practically no cells present in the mastoid, save in the antrum, which consisted of a single large cell or space filled with cholesteatoma and granulations. The posterior wall

was taken down to the epitympanic ring; it was found to be necrotic and partially broken down, and was entirely removed. The short processes of the incus were missing. Granulations and cholesteatoma were removed from the internal and external attic without disturbing the ossicles, and the remainder of the drum was left in situ. A meatal flap was cut and sutured to the temporal fascia, and the posterior wound was sutured throughout.

Since operation the feeling of heaviness and fullness has disappeared, the ear is dry and has been so for the past four months. The patient can now hear an acoumeter in the affected ear at one foot, and a moderately low whisper at the same distance.

The interesting features of this case are: First, the marked deafness, apparently absolute, in the affected ear before the operation, associated with a normal vestibular reaction, and Weber referred to the normal ear; second, the return of hearing to the affected ear since operation; third, the cessation of the discharge.

Case 2.—M. A., nine years old, was admitted for operation to the Manhattan Eye, Ear and Throat Hospital six months ago, with the following history:

Seven years previously a mastoid operation was performed upon the affected ear; three years ago a second operation was performed on the same ear. The ear had been discharging ever since the first operation. A few days prior to admission to the hospital a swelling was noticed in the old cicatrix.

Aural examination on admission showed the presence of large quantities of foul pus in the canal. Posterior to the auricle there was a swollen red cicatrix, mainly in its inferior angle. On gentle pressure over the cicatrix pus was easily forced from the canal.

Operation.—Modified radical. On opening the mastoid it was found to consist of one large cavity filled with pus. The antrum was located high up and well above this cavity, and appeared as though it had not been opened at either of the previous operations. Surrounding the antrum there was a good deal of sclerotic bone. This was removed, and the epitympanic ring of bone was broken down. Too vigorous sponging on the part of an assistant resulted in the dislocation of the

short process of the incus. The attic was curetted internal and external to the malleoincudal body; the ossicles were otherwise not disturbed. The drum was left in position, and the operation was concluded in the usual manner, except that the posterior wound was left open at the inferior angle.

The important features of this case are: First, the excellent hearing at present—acoumeter at fifteen feet—despite the previous dislocation of the incus; second, that the ear is dry and has been so for three months.

Case 3.—F. C., nine years old, was admitted to the New York Eye and Ear Infirmary for the modified radical operation fifteen months ago, with the following history: The affected ear had been discharging for five years. One year previously a simple mastoid had been performed on the same ear by myself, and the wound had never completely healed.

Operation.—On opening the mastoid the antrum was found to be filled with cholesteatoma, which was removed. The usual modified radical procedure was proceeded with.

The features of this case to which attention is especially directed were: First, that within one year after a simple mastoidectomy had been performed a large cholesteatomatous mass had formed in the antrum, which was removed at the second operation. Dr. Blackwell said that previous to this he had believed that this product of chronic bone inflammation required a much longer period for its formation; second, despite the presence of cholesteatoma in the mastoid, the ear was now dry, and had been so for the past nine months.

Case 4.—M. McB., a young adult, was admitted to the New York Eye and Ear Infirmary fourteen months ago with a history that the ear had been discharging for the past fifteen years, following an attack of measles. The patient said that for the past three weeks she had suffered with the most terrific headaches, which prevented her from sleeping. The pain radiated from the affected ear to the frontal and occipital regions.

Aural examination on admission showed a moderate amount of foul pus in canal, a slightly fluctuating discharge in the fundus, no mastoid tenderness. There was a large perforation in the drum, occupying the lower and anterior two-thirds of the membrane. Shrapnell's membrane was intact, together with the upper half of the handle of the malleus.

Operation revealed a very hard cortex, a small celled diploeic mastoid, no free pus in the cells, a large space in the antrum region filled with granulations and pus. These were removed, and the internal and the external attic were curetted. The ossicles were not disturbed.

The hearing before the operation was: Acoumeter at three feet, moderate whisper at six feet.

After operation the hearing was about the same.

The interesting features of this case are: First, the terrific headaches, which were relieved by the operation; second, there was no marked inflammation found in the mastoid or meninges to account for them; third, while the patient still has a wet ear, the discharge is much less and decidedly of a tubal character, and is not noticeable to the patient; fourth, with a healed antrum and mastoid cavity, the patient is insured against the development of serious intracranial complications, despite the presence of a wet ear; fifth, the patient's previous good hearing was not impaired by the operation.

SUMMARY.

In the first two cases the superior portion of the epitympanic ring of bone was removed as shown by Plate II.

In the last two cases the epitympanic ring was left in position, e. g., Plate I.

All of these were cases of chronic running ears. Three of them are now dry and have been so from three to nine months. In three cases the hearing has been improved since operation; in the fourth case it has remained about the same.

In dressing these cases it is most important to prevent a thick plug of granulations from developing in the attic and antrum regions, as it easily becomes infected and serves as a constant source of infection to the entire wound. The most satisfactory method of preventing this is to remove all packing from the canal at the end of a week—even removing the cotton plugs from the meatus—permitting the atmospheric air to freely enter the interior of the wound. This, combined with a system of cleansing the cavity, which the patient himself can carry out at home, has proved very effective.

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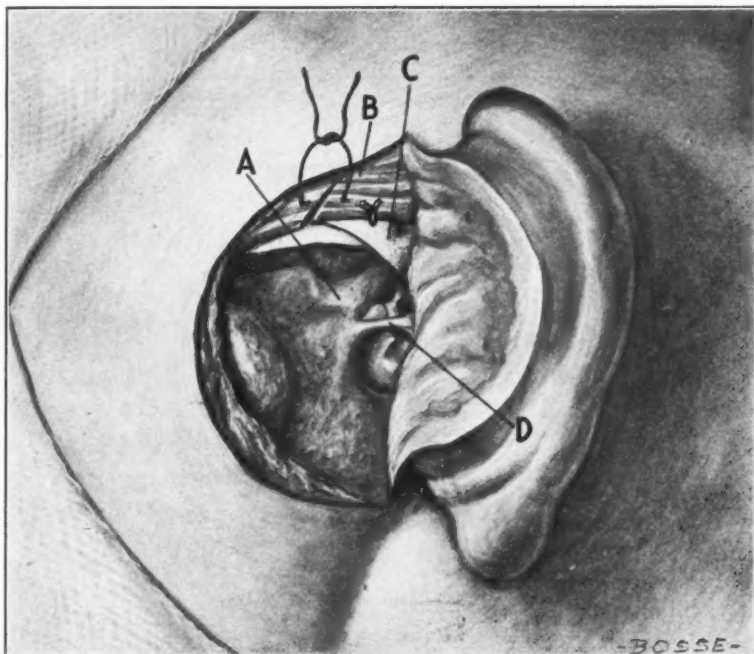


PLATE I.

View of operation prior to closure of posterior wound. Epitympanic ring of bone has been left in position. Drum and ossicles are intact. A—External semicircular canal. B—Temporal muscle. C—Plastic meatal flap sutured to fascia of temporal muscle. D—Epi-tympanic ring of bone, showing the malleoincudal body lying just above and internal, and the drum below.



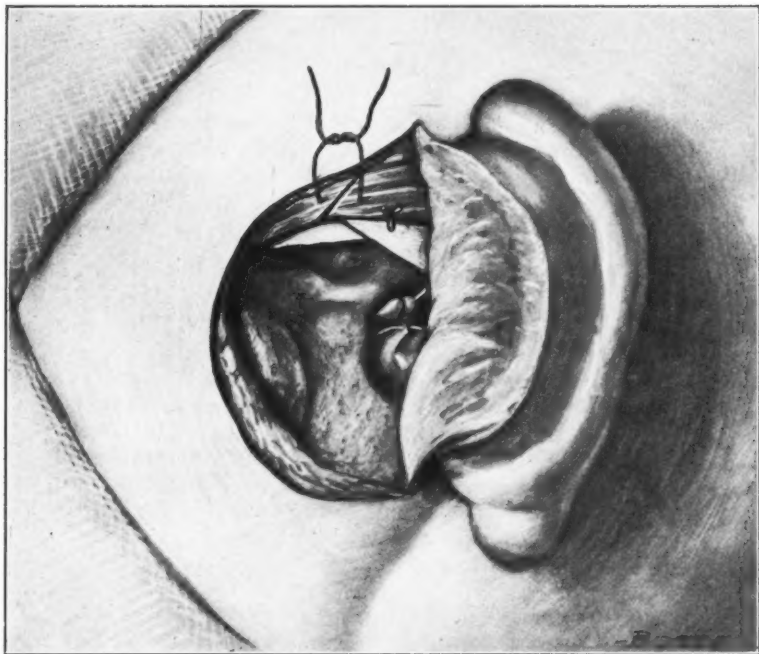
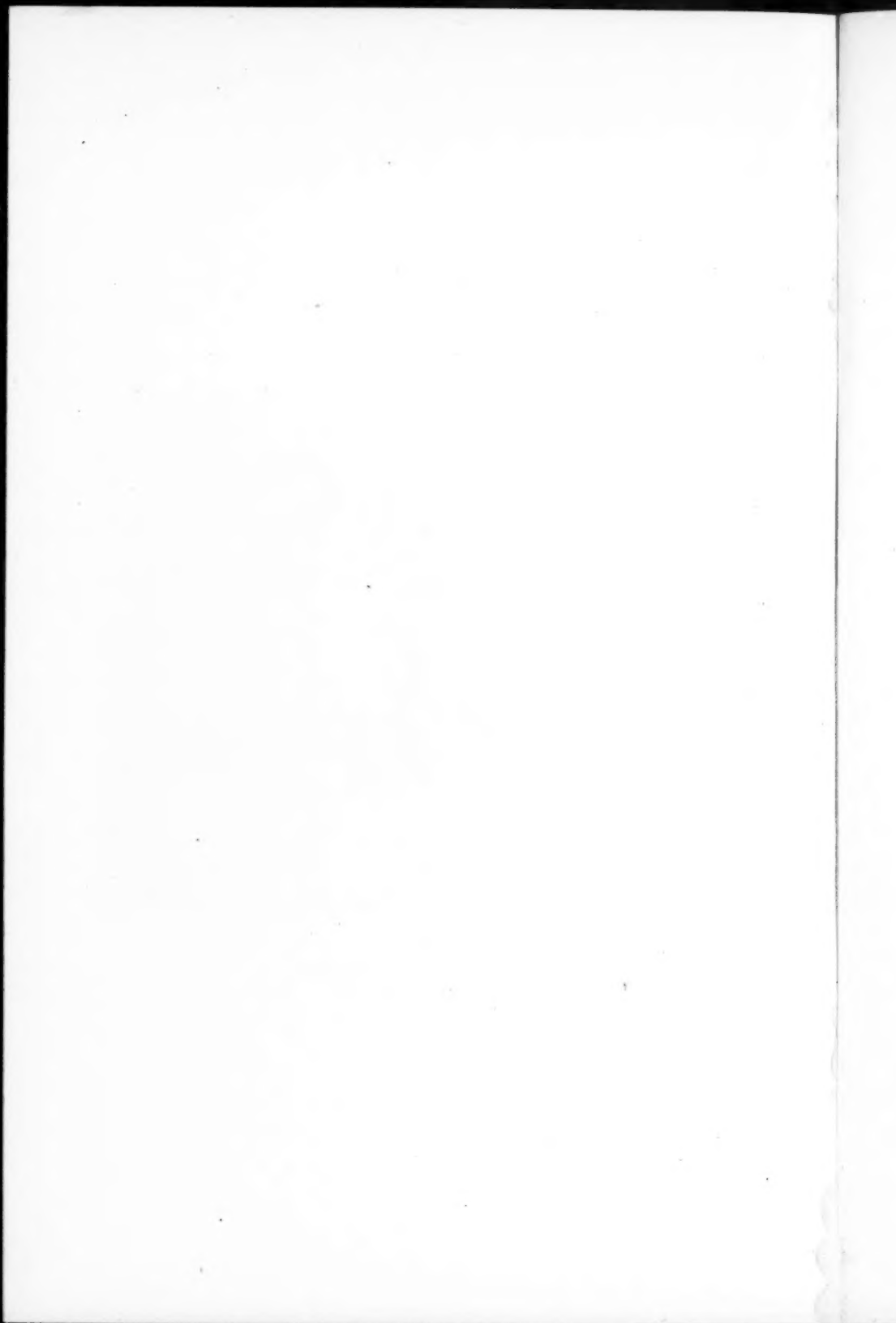


PLATE II.

View of operation completed, when the epitympanic ring of bone has been removed in the superior quadrant. Drum and ossicles are left in position.



XI.

THE TONSIL QUESTION IN CHILDREN.

By G. W. BOOR, M. D.,

CHICAGO.

The indications for tonsillectomy have widened so much since the advent of the focal infection theory that nowadays the tonsils are removed for almost any pathologic condition, and at times apparently simply because they are present. The operation has become so popular that it is recommended for all sorts of conditions. Everyone is doing tonsillectomy, and many times it is done, not only with no advantage to the patient, but even to his positive detriment. This is particularly true in children. Everyone doing dispensary work has repeatedly had patients brought in for tonsillectomy because "he has tonsils." Like oophorectomy, the craze for tonsillectomy has run wild, and now seems to have reached its height. It is to be hoped that from now on there will be less indiscriminate operating and more skillful work done.

Until the function of the tonsil is more definitely determined, we will not be able to decide as sharply as we would like just what tonsils should be removed and what should not. Better means of determining the presence and kind of infection is much needed.

There is no doubt of the fact that the tonsils are more active in childhood than in later life. If a tonsil is normal up to the age of puberty, it becomes so largely fibrous that in adult life it is of little or no importance functionally. The younger the child the more active the tonsil, and the more we should hesitate about advising tonsillectomy. The ease with which the tonsils enlarge during any infection of the throat in children shows them to be very active. The fact that many of these enlargements will subside with proper attention seems to be largely overlooked by the general practitioner, and at times even by the men devoting themselves to children's dis-

eases. If a child with acutely enlarged tonsils is put on syrup ferri iodidi for two or three weeks, a wonderful reduction in size often follows, and many children with enlarged tonsils, but with no cheesy plugs or pus in the crypts, should be so treated before deciding that tonsillectomy is needed.

Anyone who has seen many throats that have been operated upon knows that deformities of the throat may follow even a tonsillectomy that seemed perfect at the time of operation. As for the tonsillectomies that were poorly done, the less said the better, were it not for the poor victims. We have all seen deformities of the velum, distorted arches, adherent pillars, absence of uvulas, infected stumps, and the like. I once even saw a cleft palate made by a tonsil operation. Naturally, such gross deformities are made chiefly by the inexperienced and occasional operator. These deformities not only are bad from a cosmetic point, but they may cause rhinolalia aperta, difficulty in swallowing, and so on.

The effect of tonsillectomy on the voice is of importance in children, though they are probably less affected than are adults, for nature has a wonderful adaptive power in early life, and children learn to modulate their voices, even though difficulties are present.

The question is often asked, what effect removal of the tonsils will have on the patient's growth. There seems to be a popular idea that removal of the tonsils influences the sexual development of the child. I have never seen any such result. Some of the children on whom I have done tonsillectomy have become unusually well developed physically. None, so far as I know, have had their development retarded thereby.

We are often asked to remove tonsils in children because of habitual colds. Unless the tonsils are so large that they obstruct the nasopharynx, or unless there are other reasons for their removal, I discourage tonsillectomy in such cases. It has not been my experience that removal of tonsils influences head colds, unless they are large or plainly infected. Removal of adenoids in such cases is another problem.

In cases of tuberculosis of the cervical glands it is a mistake to remove the infected glands and leave the tonsils. In such cases the infection undoubtedly enters through the tonsil, and removal of the tonsil is even more important than removal of

the glands. The tonsils in such cases will often, if not usually, be found to contain a mass of rotting, cheesy material. Tuberculosis of the cervical glands seems to be on the decrease since tonsillectomy has become popular.

In chronic tubal occlusion the tonsils are usually quite as much at fault as the adenoids. In such cases the tonsils are apt to be of the buried type, and on superficial examination may not seem to be at all enlarged. Pressure on the outer side of the tonsil by means of the examining hook will show that it extends well up into the velum. Many cases of chronic suppuration of the middle ear are favorably influenced by tonsillectomy. On the other hand, acute suppurative otitis media sometimes follows on tonsillectomy.

Streptococcus infections justify removal of the tonsils more often than other types of infection. If a child has a nephritis due to a streptococcus infection of the throat, the operation is indicated if the patient's general condition warrants the risk. The same is true of endocarditis; though in endocarditis it is well to wait for the subsidence of the acute symptoms.

If the tonsils can be definitely shown to be infected, their removal on account of rheumatism is indicated. At times removal is indicated in the absence of definite evidence of infection, provided that other sources of infection are excluded.

It is questionable whether tonsillectomy should be done to relieve chorea. If the tonsils are definitely diseased, remove them. If not, I would hesitate, for I have repeatedly seen tonsillectomy done in such cases without effect on the chorea.

I expect the next generation to see less otosclerosis than the present one, because so many tonsillectomies have been done in children. This disease closely resembles a disease known to be the result of a focal infection, and furthermore has its advent in childhood and adolescence. If it is a focal infection, as I believe, removal of the most common source of infection in childhood should have a marked influence on its development, just as tonsillectomy has influenced the development of tubercular cervical adenitis.

The tonsils are but part of the lymphoid tissues in the throat. There are many islets of lymphoid tissue scattered over the pharynx, and especially behind the posterior pillars. These

islets seem to be particularly prone to compensatory enlargement if the tonsils are removed in early childhood. The condition that results is much like chronic granular pharyngitis from any other cause. This is one of the disadvantages that should be kept in mind in recommending tonsillectomy in children.

An occasional death from hemorrhage in a bleeder should remind us that we ought always to inquire into the existence of this condition in children, and if there is any doubt, to make a coagulation test of the blood before operation. This is so easily carried out that the few minutes spent in doing it are well repaid by the certainty the operator feels in a case where there is supposed to be a tendency towards bleeding.

Reports of postoperative pneumonia and lung abscess have become so frequent that this danger should be considered, as well as a means for its prevention. In most cases the cause will be found in too deep anesthesia and improper position of the patient, with resulting inhalation of infectious material from the throat. It cannot be insisted upon too much that general anesthesia for tonsillectomy should not be carried out as for ordinary operations of general surgery. The less anesthetic the patient gets, if he is insensitive to pain, the better. The anesthetic should not be pushed so far that the laryngeal reflex is abolished. If this is remembered the patient will not inhale infectious material, or if he does, he will immediately cough it out before it can reach the deeper parts of the respiratory tract to set up pneumonia or lung abscess.

Rapidly acting anesthetics like ethyl chlorid, ethyl bromid and nitrous oxid are not suitable for tonsillectomy because of their evanescence, and because to put the patient to sleep with them long enough to do tonsillectomy the laryngeal reflex must be abolished.

The anesthetist who insists on putting the patient soundly to sleep and the operator who wishes the patient so dead to the world that he can dissect out both tonsils without additional ether, are the ones who may expect lung abscesses. No one has the moral right to do tonsillectomy if he keeps his patient under a general anesthetic an hour or longer.

Anesthesia in the erect position or on the back, because it facilitates inhalation of infectious material, is to be con-

*N.B. not
suitable as
anesthetic*

demned. The suction apparatus is cumbersome, adds one more instrument to fill up the small working space, and tends to make the operator careless about the amount of time he takes and the amount of anesthetic he uses.

Cheesy plugs are not so common in children as in adults. If they are present together with evidence of focal infection, one is justified in removing the tonsil.

Peritonsillar abscess always and tonsillar abscess when it can be diagnosed, justify tonsillectomy. The former is so apt to recur when once the peritonsillar tissues have become infected, and the condition is so distressing and at times dangerous, that I make it a rule to advise tonsillectomy.

Hypertrophy, the classic indication for tonsillectomy, may or may not require the operation. If the tonsils are so large that they obstruct the nasopharynx, remove them. If they are the projecting kind that on cursory examination seem large simply because they are all seen, and no part is hidden behind the anterior pillar or in the velum, then it matters little whether they are removed or not. These are the easiest removed, with the least resulting deformity, and ordinarily with no particular change in the child's condition. Such a tonsil is rarely the seat of a focal infection or the cause of tubal occlusion. It can be removed by any method with perfect satisfaction, and is the kind that leads the occasional operator to think he is capable of doing tonsillectomy.

Tonsillectomy is occasionally indicated in diphtheria carriers, though I have never done it for this cause.

There is no doubt that children who have had tonsillectomy done are less susceptible to the infections of scarlet fever, diphtheria and ordinary tonsillitis, though they are by no means immune to any of them, and no patient should have tonsillectomy done with the idea that he will never again have a sore throat.

The following are good rules to follow in doing tonsillectomy in children:

1. Operate only for definite disease.
2. Be sure the condition of the tonsil is the cause of the disease.
3. Always do a urinalysis before operating.
4. Always inquire for a possible history of bleeding.
5. If not certain, test the coagulability of the blood.

6. Don't push the anesthetic to the abolition of the laryngeal reflex.
7. Don't be slow in operating.
8. Don't destroy a functioning organ unless the gain more than offsets the loss.
9. The younger the patient the more carefully the need of tonsillectomy should be established.

XII.

CLINICAL PROBLEMS RELATING TO THE FAUCIAL TONSILS IN ADULTS.

BY GEORGE E. SHAMBAUGH, M. D.,

CHICAGO.

The treatment of the faucial tonsils in adults has until quite recently consisted for the most part in the care of cases during an acute attack of tonsillitis. Very little was attempted in the treatment of chronically infected tonsils or for the prevention of recurring attacks of acute tonsillitis. Two causes prevented more being attempted in the treatment of these conditions. One was the failure on the part of the profession to appreciate the serious menace, either from the occurrence of acute tonsillitis or from chronic infection in the tonsils; the other cause was the unsatisfactory methods at our command for the treatment of tonsil trouble in adults.

The general physician, as well as the throat specialist, has only recently begun to appreciate the serious systemic conditions which owe their origin to infected tonsils. It is now generally recognized that such conditions as neuritis, acute and chronic rheumatism, Bright's disease, and cardiovascular degeneration owe their origin for the most part to foci of infection such as are frequently found in the faucial tonsils. Evidence is accumulating, moreover, which throws suspicion more and more on the tonsils and other foci of infection as the cause of gastric and duodenal ulcer, various lesions involving the eyes, as well as acute and chronic neuritis of the eighth nerve.

With the development of this knowledge regarding the part which acute and chronic infection in the tonsils takes in the etiology of systemic disease, there has naturally arisen a demand for effective methods of treating infected tonsils. The older methods, such as slitting the tonsil pockets and cauterizing the tonsils, were so often unsatisfactory, that we were frequently inclined to leave the tonsils entirely alone rather than

attempt this treatment. It has only been since we have learned that tonsils in adults can be safely enucleated that we have found a satisfactory method of handling tonsil trouble in adults.

Starting, then, with the assumption that chronic infection in the tonsils, as well as the tendency to attacks of acute tonsillitis, is often a distinct menace, especially as the cause of serious systemic disease, and with the conclusion that enucleation of the tonsils is the proper method of treating tonsils suspected of causing systemic infection, I wish to discuss some of the clinical problems which confront us in the treatment of tonsils in adults.

We have heard a good deal in recent years about the practice of indiscriminate tonsillectomy, the so-called "massacre of the tonsils," especially in children. Those of us who have been most interested in the question of the relation of tonsil disease to systemic infection are especially anxious that the proper indications be recognized before the removal of the tonsils in adults is advised.

The statement is sometimes made that tonsils in adults are never found to be normal. Even if we accept this statement, we must, nevertheless, insist that the indiscriminate removal of tonsils, even in cases suffering from systemic disease of focal origin, is not indicated. We are free to admit that the indication for tonsil removal may at times be quite obscure, but we cannot emphasize too strongly the fact that the mere presence of a systemic infection is not of itself an evidence against the tonsil. In order to avoid as far as possible unnecessary operations on the tonsils, it is of great importance that the throat specialist should not assume a greater responsibility in the management of such cases than he is competent to handle. There are many cases in adults where the indications for tonsil removal rests chiefly on the local trouble in the pharynx. In these cases the throat specialist is, as a rule, best able to decide what should be done. Cases coming under this head include those where there is a tendency to attacks at frequent intervals of acute tonsillitis. In a few cases the local annoyance from the accumulation in the tonsil pockets of foul-smelling cheesy concretions, especially when the tonsils are much enlarged, is sufficient to constitute a proper

indication for removal of the tonsils. In the great majority of cases in adults where the removal of the tonsils is indicated, the question is not so much one of local annoyance to the patient as it is one of systemic poisoning from chronic infection in the tonsil, or as the result of acute attacks of tonsillitis. It is in just these cases where the cooperation between the throat specialist and the internist is necessary, if we are to avoid the risk of doing unnecessary operations.

The cases are relatively few where the development of systemic trouble, such as rheumatism, Bright's disease, or endocarditis takes place simultaneously with an acute attack of tonsillitis, so that the throat specialist can conclude, without hesitation, that the tonsil infection has been the cause of the trouble. In the great majority of cases where the tonsils are responsible for the systemic infection, this conclusion can be reached only after an exhaustive examination of the case, which can be done more efficiently by the internist than by the throat specialist. In many of these cases where the tonsils are suspected of causing systemic infection the first thing to be determined is the exact nature of the trouble from which the patient is suffering, and whether this trouble is one which is known to be the result of focal infection. The throat specialist ought not to assume the responsibility of passing on these questions. They are problems which fall more properly in the work of the internist, and often constitute one of the most difficult problems for him to solve.

When it is determined that a patient's trouble is probably the result of a focal infection, the next step is to determine the probable location of this focus which is causing the systemic trouble. Here again the problem is more one for the internist than it is for the throat specialist. The examination of the tonsils and of the nasal accessory sinuses is but a small part of the work to be done before the probable focus can be determined. Not infrequently several suspicious foci of infection are discovered, and the question as to the best course to pursue in clearing up the several foci is again one for the internist, who is in a better position to view the case from all sides.

The responsibility which belongs peculiarly to the throat specialist is in determining whether the tonsils are the seat of an infection which might be capable of causing systemic trou-

ble. The answer to this question in some cases can be readily decided, but in others the answer is not so apparent. When, for example, there is a distinct history of recurring attacks of acute tonsillitis, we are quite justified in concluding that the tonsils are the carriers of infection which may be responsible for a systemic trouble. Not infrequently there is no distinct history of acute tonsillitis, but the patient states that there are frequent attacks of slight sore throat. In such cases the sore throat, as a rule, is nothing less than mild attacks of tonsillitis. It is usually best, however, to ask the patient to return during an acute attack, when an examination of the tonsils can determine whether they are the seat of an acute inflammation.

In many cases an examination of the tonsils discloses unmistakable evidence of chronic infection. In not a few cases pus can be actually expressed from the tonsil. More often evidence of infection consists in a congestion involving not alone the free surface of the tonsil, but of the anterior pillar in proximity to the tonsil. Enlarged tonsils from which masses of epithelial debris can be expressed from the crypts should always be regarded with suspicion. On the other hand, tonsils which are the seat of a few cheesy plugs, especially when they are not associated with a distinct congestion, can hardly be classed as infected tonsils from the local findings alone.

It is a well known clinical fact that tonsils which are the seat of such frequent attacks of acute inflammation as to justify the conclusion that they are persistent carriers of infection may, nevertheless, between these acute attacks, show very little that could be construed as evidence of chronic infection. It is also a very frequent experience to discover distinct evidence of chronic infection in tonsils; as, for example, the presence of pus which can be expressed from the tonsil, where there has been no history of attacks of acute tonsillitis or of sore throat. It is evident, therefore, that there may be cases where neither from the history of acute attacks of tonsillitis or from the local findings in the tonsils is there any positive evidence of tonsil infection, and still they may be the seat of an infection capable of producing the most serious systemic trouble. It is this class of cases where the indication for removal of the tonsil is the most difficult to work out. Because such cases are known to occur, must not be construed as an indication for

indiscriminate tonsillectomies in cases suffering from systemic infection. Only in cases where the systemic infection is of a serious character, and where a careful search by a competent internist has failed to discover any probable focus of infection, should the advice be given to have the tonsils removed.

The operation for the removal of tonsils in adults is by no means a minor operation, and while the indications for this operation have been greatly increased by a better appreciation of the menace existing in tonsils the seat of chronic infection, still it is quite evident that the indiscriminate removal of tonsils in adults is to be discouraged. The decision to remove the tonsil can be reached in a great many cases only after a careful investigation, which, to be complete, requires the cooperation of the internist.

XIII.

THE SURGICAL TREATMENT OF SUPPURATION IN THE JUGULAR BULB.

BY JOHN MCCOY, M. D.,

NEW YORK.

In a small proportion of cases of thrombosis of the lateral sinus and jugular vein, in which we have performed the operation of incision of the sinus, excision of its outer wall and ligature, or excision of the jugular vein, we are confronted with a condition of suppuration from the jugular bulb with septic symptoms. This is evidenced by the persistent appearance of pus welling up at each dressing from the lower end of the sinus; in other words, a small quantity of pus wells up from the jugular bulb into the lower portion of the mastoid wound.

A typical case which occurred in the writer's practice was as follows:

A boy, aged ten years, was seen in consultation, and gave the following history: Two weeks previously had earache, followed by discharge from the right ear. About three days before the writer saw him he had a chill, fever and sweat. This recurred on each succeeding day, and when seen he was found to have a purulent discharge from the right ear through a small sized perforation in the lower part of the drum. He was slightly tender over the mastoid antrum and tip. A blood culture was immediately taken, and the following day disclosed the presence of streptococcus in the blood. The boy was operated on that day, and the mastoid showed a diploeic bone, and the cells were congested and filled with granulations. The sinus plate was found intact and hard. The sinus was uncovered and found discolored and covered with a thin layer of exudate. It did not pulsate and felt firm to pressure. It was opened and found completely filled with clot. No flow

from either torcular or jugular end. The outer wall of the sinus was removed and the clot curetted out. The clot extended far back to the torcular. The clot towards the bulb was not disturbed, but the neck was opened and the internal jugular vein was resected from one inch above the clavicle far up towards the bulb. No clot was found in the vein. It was slightly discolored and sheath adherent.

The child stood the operation very well, and after zig-zag temperatures, from 101° to 104° for a week, the temperature gradually dropped to 99° in the morning and $100\frac{1}{2}^{\circ}$ in the evening. After running along this way for five or six days the temperature again became septic, ranging from 100° to 103° , and the few drops of pus which welled up from the lower cut end of the sinus of the mastoid wound gradually increased to a half teaspoonful or more at each daily dressing. The child became increasingly restless and sleepless, and batted his head about a great deal. After a week or so of these symptoms the writer decided that it would be the wisest plan to secure adequate drainage from the jugular bulb. It was at first thought that he might be able to pass a fine catheter containing a fine wire from the lateral sinus into the bulb and down through the vein. This, however, was found quite impracticable, and with the assistance of the general surgeon the neck was opened and the jugular bulb was reached with considerable ease. The vein was split up and the bulb was drained (according to the method later to be described as Tandler's).

For the relief of this condition several surgical procedures have been devised. This paper is based on a series of dissections which have had for their basis a determination of that method which accorded the easiest and safest way of draining the jugular bulb and avoiding injury to contiguous vital anatomic structures.

Of the several methods devised for relieving this condition, the writer will describe some briefly, because they do not appeal to him as surgical measures worthy of serious consideration, and others more in detail, because they might be employed with more or less success. He will then give his conclusions as to the best of the latter.

I would first mention the skin fistula of Alexander. The

skin fistula method of Alexander is probably the simplest measure devised for drainage of the bulb. It consists in suturing the jugular vein, where it has been cut off, high up in the neck, to the skin incision in the neck, leaving the vein open. This would probably prove a more or less effective method if we found pus welling up from the bulb at the time of operation, but if this condition did not exist, then we would render our patient liable to a hemorrhage from the inferior petrosal sinus.

Neumann has devised a method in which he says that he passes a Gigli's saw over which a Nelaton catheter has been passed, from the sinus at the lower end of the mastoid wound through to the bulb, until it comes out at the peripheral end of the jugular; or reversed, the instrument may be carried from the stump of the jugular into the bulb. After the introduction of the instrument, the catheter is removed and the wedge of bone surrounding the bulb may be sawed through from within outward. This method the writer considers very difficult, if not impossible, in the majority of cases.

Piffi has devised an operation in which, after separating the membranous canal wall, as we do in the radical mastoid operation, and pushing aside all tissues up to the glaserian fissure, by means of bone forceps he removes the floor and part of the anterior wall of the bony external canal to the hypotympanum. He says that having gotten this far, as a rule, the upper portion of the internal jugular vein makes its appearance, then exposes the bulb by exposure of its outer margin. This the writer considers a most difficult and dangerous procedure.

Voss has devised an operation in which he enters the bulb from the lower portion of the mastoid wound. The steps are briefly as follows:

- (1) After exposing the sinus and removing the overlying bone downward to the lowest part of the vein, the vein becomes more and more horizontal, the lateral wall of the sinus becoming the inferior.
- (2) This lower wall of the sinus is followed by removing bone with concave gouges.
- (3) By following the course of the vein with a probe, the distance of the anterior wall of the jugular fossa can be determined.
- (4) The next step in the operation, the exposure of the bulb, is accomplished by very cautiously removing the bony wall above

the anterior boundary of the jugular fossa (to avoid injury of the horizontal semicircular canal the bone is not removed higher than one-half centimeter). He says the posterior membranous wall of the bulb is readily exposed in most cases of a well defined bulb. After the posterior wall has been removed up to the roof of the bulb, it sometimes becomes necessary to remove the edge of bone which marks the separation of the sinus proper and the bulb. This shows the sharp knee from where the lateral wall of the sinus goes into the posterior wall of the bulb.

The method of Grunert is more extensive than this, and may be described as follows:

(1) The complete resection of the tip of the mastoid. (2) The separation of the three muscles from the base of the skull, namely, the sternomastoid, digastric, and the splenius capitis. (3) The soft parts are retracted as we work toward the base of the skull in a horizontal direction, in order to reach the jugular foramen. (4) The operative field is sometimes considerably narrowed by a prominent transverse process of the atlas. This may have to be resected. In doing so one must be careful not to injure the vertebral artery. (5) The rectus capitis lateralis must now be pushed aside in order to remove the last bridge of bone between the free margin and the jugular foramen. (6) The bulb is now split from the sinus end, and the free lying lateral wall is excised. (7) The bulb is now inspected and curetted free from thrombus masses. If the internal jugular appears normal, he stops there and packs the bulb with iodoform gauze, but if the vein shows a thrombus, then it can be laid open and packed.

The Tandler operation is as follows:

(1) The mastoid incision and the incision for the jugular are converted into one. The sternomastoid muscle is separated for its entire length and pushed posteriorly. (2) You can now search for the spinal accessory nerve. When it is found, it is tied loosely with a suture so that it may be in good view during the operation. We may dissect without danger and follow this nerve almost to its exit at the jugular foramen. (3) If now the finger is passed deeply into the wound, we find a space between the styloid process and the mastoid process. Here the exit of the facial nerve through

the stylo-mastoid foramen may be exposed. (4) The digastric muscle is separated from the digastric fossa and shoved forward and downward. If we work on a line below the stylo-mastoid foramen and this muscle, there will be no danger of injuring the facial nerve. (5) After pushing aside the digastric, the occipital artery may be ligated in two places and cut. (6) The jugular vein may now be separated with the margin of the jugular foramen, which can be felt with the finger. Now loosen the uppermost portion of the vein, after pushing aside the periosteum at the base of the skull, and the rectus capitis lateralis. (7) The bone is now removed from the sigmoid sinus to the bony margin of the jugular foramen, and the sinus bulb and vein are split wide open.

Several anatomic facts must be borne in mind in the performance of these operations. In the first place, it is found that the jugular bulb is very deficient on the left side of the skull in the majority of people (some say as high as seventy-five per cent). This is shown in the skull pictured; also the fact that three large and important nerves pass through the jugular foramen, namely, the glossopharyngeal, the pneumogastric, and the spinal accessory. In our manipulations we must be careful not to disturb or injure these nerves, as the spinal accessory sometimes is situated ventrally and sometimes dorsally. This is the nerve which is most apt to be injured.

Grunert gives as indications for the bulb operation the following:

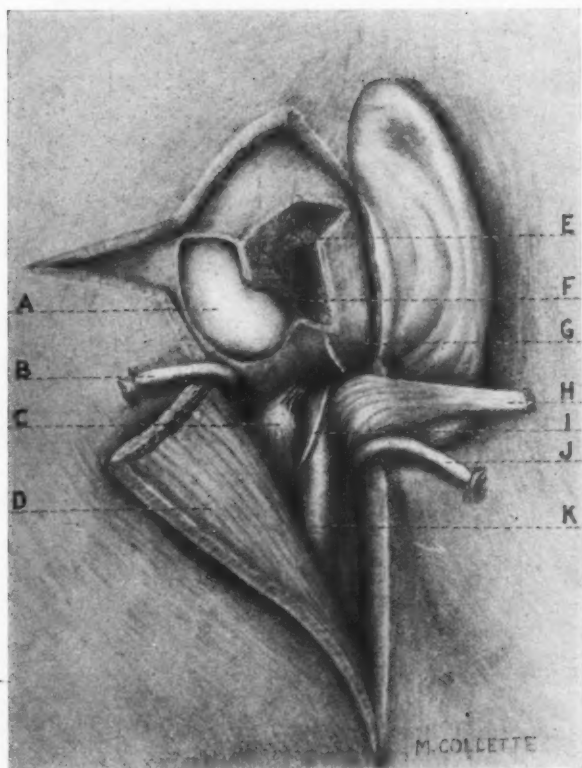
- (1) For opening of the bulb at the primary operation, isolated cases of both mural and obstructing bulb thrombosis.
- (2) Cases where diseased bone extends to the jugular foramen, making necessary an exposure of the bulb.
- (3) Cases of otogenic pyemia with a sinus and bulb thrombosis, with severe septic symptoms. Secondary opening of the bulb is indicated after freeing the sigmoid sinus and performing jugular ligature or resection, when severe pyemia exists, high fever, chills and suppurative destruction of the clot in the bulb.

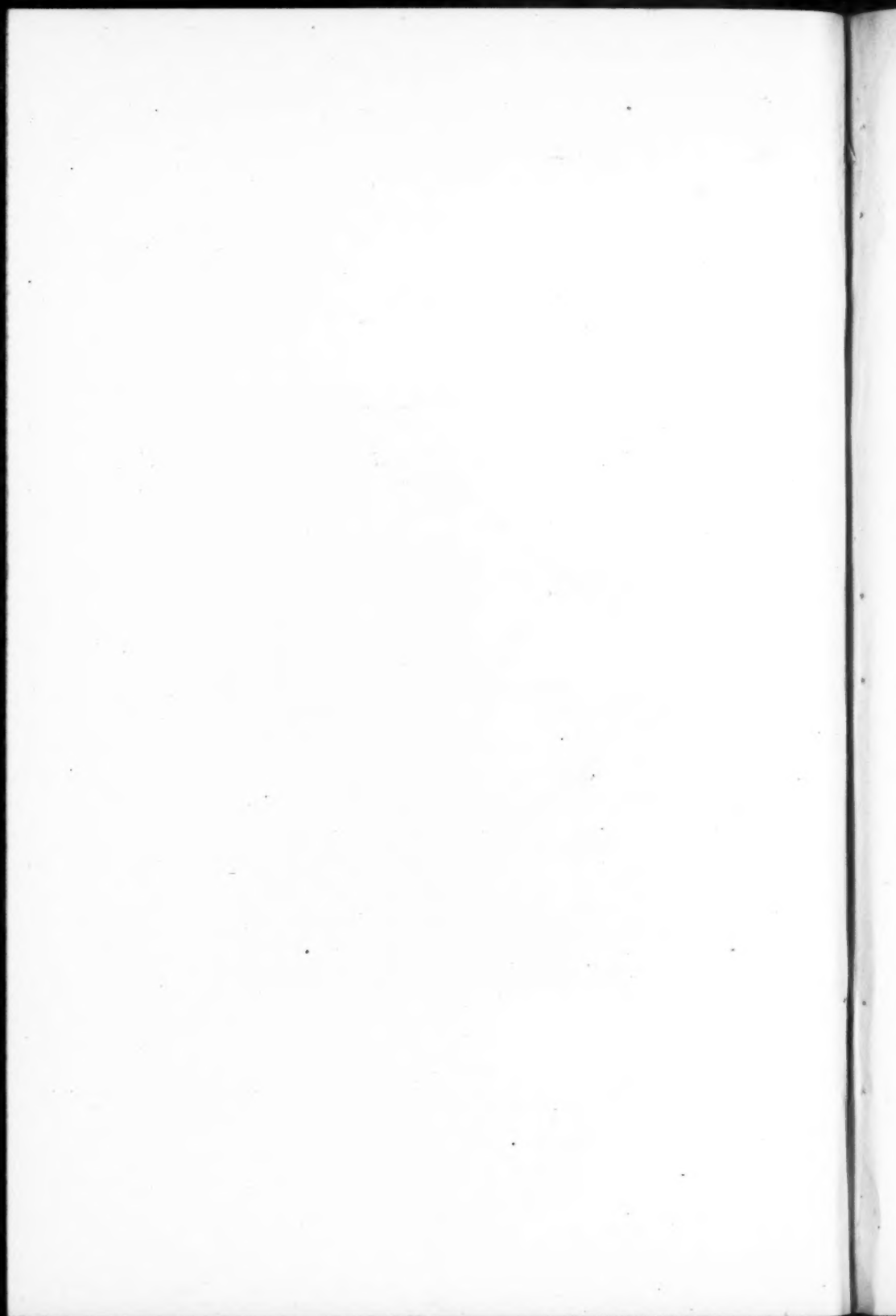
In ending, I may state that the operation described by Tandler gives the easiest, simplest and safest method of reaching the jugular bulb, and most skillfully avoids danger of wounding the surrounding vital structures.



This illustration shows a well developed jugular bulb on right side, and a very poorly developed one on left side. Area within dotted lines shows route from mastoid to jugular bulb.







XIV.

SALIENT FACTS REGARDING TONSILS IN CHILDREN AND ADULTS.*

BY JOSEPH C. BECK, M. D.,

CHICAGO.

It would appear that another paper on the tonsil would be superfluous before this society, especially after two such splendid contributions to the subject as were presented at the last meeting. Perhaps you will find it superfluous, but to the writer, as well as a number of gentlemen present at that meeting, it appeared that the matter of the importance of the tonsil in the human economy was not sufficiently covered and an impression was left in the minds of many that everyone needed an apology to himself and his patients on whom he had operated for the removal of their tonsils. After listening to the two papers and some of the discussion the writer realized that the time limit allowed for discussion would not permit him to bring out the points he wished to emphasize, and consequently this paper is presented.

I shall ask your indulgence in this presentation by overlooking the unsystematic manner in which it is done, simply because it will contain mostly casuistic reports.

As to indications for operation—that is, tonsillectomy—whether in children or adults, I wish to make a broad statement, that with the exception of a few contraindications, every tonsil is better out than in, and I have no knowledge of a single instance where the patient was worse off from the tonsillectomy than he would have been with the tonsils not removed. This refers to tonsillectomy and not tonsillotomy. These contraindications I admit are:

1. All acute inflammations or infections.
2. Luetic, particularly ulcerative processes.
3. Advanced tuberculosis.

*Read before the Chicago Laryngological and Otological Society, December 19, 1916.

4. Advanced cardiovascular changes; that is, in individuals who would be endangered by any sort of a surgical procedure, as in all constitutional diseases where the anemia is very marked; for instance, leukemia, pernicious anemia, etc.

5. Advanced cases of diabetes mellitus.

6. Low coagulating power of the blood, as in true hemophilia, cholemiias, etc.

7. Blood pressure over 225 systolic.

8. Infants below one year of age.

9. Grave mental diseases in which marked excitation is present, as Graves' disease, Basedow's disease, maniacal state, etc.

10. And, as one of my students said in answer to this question, anyone that has never had sore throat, and is in perfect health as shown by physical and laboratory examination.

This is an *ava rara*. I am cognizant of the fact that tonsillectomies are, have been, and perhaps will be performed in many of the above mentioned conditions as contraindicated, but I should advise against such procedures. That tonsillectomy is not overdone or a fad is proven by the mass of evidence of the wonderful results, and the time limit has long passed in comparison with other surgical procedures, which had only a temporary existence, such as uvulectomy, inferior turbinectomy, certain eye muscle operations, ovariectomies, and the orofacial surgery.

Tonsillectomy, like appendectomy, cholecystectomy and a few others, is here to stay, and an effort on our part to stop this splendid life work in making a stronger, better race, would be a discredit to our profession. It should be our purpose to improve our technic so as to do away with any and all possible dangers and after-effects from this operation.

Some of these were brought out in the papers and discussion, but I wish to take issue with some and perhaps add others not mentioned.

One bad result reported is that of scars or deformities causing trouble with voice production. Dr. Kenyon would like to see an intracapsular tonsillectomy in cases of singers. I have never operated on a prominent singer, but have on a fair number of good professionals and amateurs, and I have never seen any bad effect nor heard complaints following a

carefully performed tonsillectomy with the capsule. I have developed, however, an operation (intracapsular tonsillectomy) which I explained to Dr. Kenyon, and invited him to see. The description of this technic will follow later. Following the contraction of these scars, there have been complaints of pains in the throat, but these were not lasting.

Another bad effect of the tonsillectomy, especially when radical, refers to symptoms resembling cretinism and marasmus in infants up to the third year; consequently, with the rarest exception do we operate under that age. This observation as well as age limit is not conceded by many laryngologists, but we have observed it often enough to make us adopt such a course.

Another after-effect following tonsillectomy, as in any other operation, is the postoperative neurosis, especially in adults; but since we have adopted general anesthesia this does not occur so often. My method is as follows: Gas, followed by ether, rebreathing or drop method, until relaxation is sufficient to permit introduction of the mouth gag; then this is followed by the ether vapor method, during which the major part of the operation is performed. This is followed by the open gas method, to completely control any oozing, especially from the adenoid region. Patient should awaken on the operating table and return to bed with a dry throat. The laryngeal reflexes are never allowed to become abolished for a second. As the pupillary reflexes are always the indicators of the depth of anesthesia, the pupils are never allowed to become dilated. Therefore, the patient is neither superficially nor deeply anesthetized—just enough to have the pharyngeal muscles completely relaxed and be unconscious.

Another matter of importance is the prevention of aspiration of blood which may cause abscess of lungs or pneumonia, the subject that has recently been very prominently brought before the profession, especially by the general surgeon. This can always be prevented by employing suction and immediate and permanent control of the bleeding. We have never had a case of either abscess or pneumonia following tonsillectomy. There is not any doubt that the best way to deal with bleeding vessels is to grasp them and tie them, and this we do in every case after we have locked a sponge in the tonsil cavity for a

few moments, if we find that the bleeding has not stopped. It is, however, extremely rare that we have to resort to tying. The quickest and surest way of tying a vessel in the tonsillar fossa, especially at the inferior pole, is to grasp the bleeding point with an Ellis pick-up forceps, which is specially constructed for this purpose, and which permits some tissue to be lifted, below which it is easier to tie. A needle may carry the ligature about this grasping forceps to further prevent it from slipping after it is tied. To prevent subsequent oozing, we have in the past two and one-half years employed in every case of adults (sixteen years and over) a small inlay of gauze or rubber, stitched over by the edges of the anterior and posterior pillars. This is allowed to remain from two to twelve hours. This procedure is employed in preference to ligation, because it is easier, although perhaps not as agreeable to the patient. This control of the bleeding will prevent another very annoying condition, namely, the swallowing of blood, with subsequent vomiting and kapremia.

Another disturbing factor following tonsillectomy, especially dissection, is the secondary reaction of exudate formation and infiltration. The use of iodine—and we prefer balsam of Peru in olive oil—will diminish this considerably. Marked septic cellulitis we have never had, but in some cases have had considerable edema of the uvula, perhaps due to the unnecessarily prolonged traction by the catheters which we employ in exposing the postnasal space. The frequent complaint of earaches, pain on swallowing, or a distinct nasal twang to the voice are all transitory and usually disappear within a week. Tincture of iodine, applied to the fossa, relieves these conditions, as will the gargling of weak warm tea and seltzer water, equal parts.

Another more rare condition following tonsillectomy, and, for that matter, any operation under long continued ether anesthesia, is acetoneuria or acidosis. The routine use of bicarbonate of soda, thirty to sixty grains in one-half pint of water, introduced per rectum about one-half hour before operation, will go a long way toward preventing this condition, and if it occurs, characterized by considerable nausea and vomiting, with noticeable sweetish breath, it can be controlled by more

bicarbonate of soda solution and the additional use of grape sugar.

One of the most disappointing results following tonsillectomy is the failure to obtain benefit from the operation, either from the local or more frequently general or distant conditions. For instance, it has occurred to us that following a perfect tonsillectomy the patient will have an attack of acute sore throat, and examination reveals a white spot or two. This is not tonsillitis, but a folliculitis in the lymphoid tissue, which in many instances has increased as a compensatory factor. Very frequently the lymphoid tissue at the base of the tongue and back of the posterior pillars will undergo marked hyperplasia, but this does not last, and only in rare instances is it necessary to attack it surgically.

Glands of the neck, if they are tuberculous and broken down, will often not disappear following tonsillectomy. I do not consider the remains of tonsils as a bad after-effect from tonsillectomy, because it is not a tonsillectomy. It may, however, occur in the hands of the best operators, and when discovered, reoperation is necessary.

A hypertrophied plica tonsillaris which must not be mistaken for remains of a tonsil does no harm.

When a general condition, as articular or periarticular rheumatism, endocarditis, myocarditis or pericarditis, pleuritis, myositis, neuritis and perineuritis, nephritis with the characteristic blood picture of a chronic septic absorption, does not immediately disappear in every instance following tonsillectomy, there appears to be some skepticism expressed as to the value of the procedure. In most of these cases in due time, especially if aided by autogenous vaccination, either specific or haphazard, as well as the elimination of other foci, very satisfactory results are obtained. There are a fair number of patients suffering from these conditions in whom, no matter what is done, the symptoms persist. An alcoholic neuritis, a brachial plexus neuralgia from pressure of a supernumerary rib, a sciatica from pressure of a sliding sacroiliac joint, will not be influenced by a tonsillectomy. However, I have seen tonsils operated upon in such cases.

In conclusion I wish to mention some general conditions in which tonsillectomy appears to be of benefit, namely, in the

disturbance of the glands of internal secretion. Hyperthyroidism is very beneficially influenced, and many cases of thyroidec-tomy for this condition are unsuccessful until the tonsils have been removed. Otosclerosis, which was early looked upon as an osteoporosis, due probably to disturbed function of the glands of internal secretion, a hypoadrenalism, is corrected by a tonsillectomy, which should bring such a case to a standstill. There is no scientific proof of these statements—only the clinical facts.

One of the most recent claims for the tonsils as a causative factor as an atrium of infection is in infantile paralysis. Rosenow and Nuzum have found in every case they examined a small diplococcus in the tonsils of these patients, which, when inoculated into rabbits, produced symptoms not unlike infantile paralysis. In Nuzum's work at Cook County Hospital, in all but two of the children that had had a tonsillectomy previous to the attack of paralysis, the disease was mild and complete recovery followed. These two had stumps of tonsils left. All the cases that had the tonsils removed subsequently to the disease made a more speedy recovery than those that did not.

So far as the pathology is concerned, we consider the surgical and nonsurgical forms. It is the former that we are mostly concerned in.

In 1902 I reported on my histologic studies of tonsils removed, and found there were varieties of changes, namely:

1. Hyperplasia.
2. Hypertrophy with inflammation.
3. Cicatrization with degeneration of epithelium in crypts, also known as caseation or cholesteatomatous formations (Pierce).
4. Chronic abscess formations (blind abscess or caseation).
5. Tuberculosis.
6. Sarcoma.
7. Carcinoma.
8. Actinomycosis.
9. Hyperkeratosis.

Since then I have found cases of cartilage in the tonsils, also stones within the crypts. My work includes histologic studies of two hundred and twelve individuals.

Each of these conditions has a distinct importance as to diagnosis and treatment, and would be of interest to go into more thoroughly, but there is no room for such consideration in this paper except to answer Dr. Libby that his classification of the pathology is inefficient. The terms submerged tonsils and peritonsillitis are very happily chosen, although neither is correct; that is, they do not exist as pathologic entities. Retracted tonsils and tonsilloperitonsillitis expresses more nearly the real condition. As to the bacteriology within the tonsils, many nonpathogenic varieties are found, and others which have nothing to do with either the local or general systemic conditions. They are, as a rule, not very active, but their toxins are positive in their production at least of blood changes. It is the slow and constant absorption of these poisons or toxins that is injurious.

I cannot close without expressing my deep gratitude, and I am sure that of all of you, to the men who have contributed so much to the tonsil question as Billings, Rosenow, Pyncheon, Ballenger and Sluder. It does not matter what technic we employ in the removal of the tonsils, so long as we remove them all and nothing more.

Billings and Rosenow, in their development of the subject of focal infection, placed the tonsil among the most important agencies for the entrance of chronic infection. Pyncheon was the pioneer of tonsillectomy, although his method by means of the electrocautery did not become popular. Ballenger perfected Pyncheon's technic in performing tonsillectomy by dissection and snare, and Sluder originated a plan of tonsillectomy with the least amount of loss of pharyngeal tissue and traumatism, performing the operation with one instrument, without any preliminary dissection.

In an article published by me in the *Journal of Surgery, Gynecology and Obstetrics*, 1915, entitled, "The Evolution of the Tonsil and Adenoid Operations," all these factors were brought out in detail, but today I will satisfy myself by the above reference and the presentation (demonstration by lantern) of a collection which represent the main types of instruments in use from ancient times until the present day (Figure 1 to Figure 5).

By request I present our present method of dealing with the tonsils and adenoids.

TONSILLECTOMY.—Let me say at the outset that we always try to remove the tonsil with Beck's tonsillectome (original pattern), and if the dislodgement through the ring does not take place readily, we resort to the dissection rather than to persist in the ring technic. The steps are as follows:

(1) General anesthesia (preferably operating in the morning).

(2) General preparation. A light or no supper, and a mild cathartic the night before operation. In the morning a glass of milk or coffee or coca or nothing. The bowels should be washed out and a solution of bicarbonate of sodium injected into the rectum and allowed to remain.

(3) Atropin gr. 1/150 hypodermatically in adults, and in children, we give only 1/200 of a grain of atropin by mouth.

(4) The patient should be taken to the operating room on a cart, preferably without any information given to him in advance. The operating room should be quiet; the physician, whom the patient knows, the surgical nurse and anesthetist alone are present while the patient is going to sleep. Besides these three, one of the family may be present until the patient is unconscious.

A preparation or anesthetic room adjoining is preferable to the operating room for the administration of the anesthetic. When the technic of the anesthetic is so far advanced that it will be practical to do this, it will go a long way towards removing the terrors of an operation. In fact, if a patient could be put to sleep without knowing that he was to be operated upon at that particular time (something like Crile's idea of anocia association) many of the after-effects, as postoperative depression, etc., would be avoided.

(5) The patient is put in the recumbent position (not strapped to the table) until he is partially under the anesthetic. He begins by voluntarily breathing nitrous oxid gas from the mask, which is put on lightly until he shows evidences of slight cyanosis. The curved mouthpiece through which the properly warmed ether comes is put in the corner of the mouth, between the lips and teeth, under the gas mask. While the gas is being given the ether is supplied in slight quantity. The gas mask is now removed and either the rebreathing ether bag and mask (Figure 6), or a regular gauze covered

wire mask is substituted. As soon as the patient is sufficiently relaxed the writer's mouth gag (Figure 7) is introduced by the operator while the assistant passes the two small (size No. 2) urethral catheters through the nose into the oropharynx. The operator depresses the tongue and employs the suction tube to remove the mucous secretion, and then grasps the free ends of the catheter and withdraws them out the mouth. The assistant joins the two ends of each catheter by a spring clamp, to prevent their displacement during the tonsil operation. A gauze pad about the size and thickness of a hand, which is wet, is placed over the open mouth, and the flow of ether vapor is increased by the valve on the writer's anesthetic suction apparatus (Figure 8) so as to cause pharyngeal relaxation. The rhythm of breathing and the pupils are watched very closely, as the borderline between sufficient anesthesia and excessive narcosis is very narrow. We have never had a fatality or any other untoward result with this method of anesthesia, yet very deep anesthesia has occurred, and this is always unpleasant. The field of operation being thoroughly illuminated by the writer's head light (Figure 9) (nitrogen globe and aluminum reflector, which never gets hot), the right tonsil is first removed. With Beck's tonsillectome (Figure 10) (usually the medium size) in the operator's right hand the tonsil is lifted into the supratonsillar fossa until it appears like a small round mass behind the arcus palatinus. The instrument now lies diagonally across the tongue, in which position it is firmly held while the index finger of the left hand presses on the above mentioned round mass behind the arcus palatinus until it has passed through the ring of the instrument. The pressure exerted should be steady, and the counter pressure of the instrument should be equal to that of the finger. It is important to be sure that the entire tonsil has passed through the ring, particularly the upper pole, which can be engaged by giving the ring a sort of half twist. The entire circumference of the ring will usually be felt, if all the tonsil has been engaged. The index finger is held in this position to guard the tonsil from slipping back, the left thumb disengages the lock of the snare, and the right hand draws down the wire loop. The left index finger feels this wire under the soft palate as it is drawn down. The left index finger can now be

taken away and the snare locked again. The tonsil is now observed everted from its capsule encircled by the snare, and at the lower portion of the anterior pillar a sort of a dimple is seen, which indicates complete eversion of the capsule. At this point it is necessary to decide whether to remove the tonsil with or without capsule. It is only seldom that we resort to the former or intracapsular method. The method is as follows: About one-half of the protruding mass is clipped off with curved scissors, then a sharp curette is used to remove the remainder. In all these cases the wire must be drawn down much more firmly, otherwise the capsule will slip back before all the crypt portion of the tonsil is removed. After the capsule has slipped back the field should be explored, and if an area is found suggestive of a tonsil crypt, it should be further curetted.

The extracapsular or usual operation is completed by grasping the protruding everted tonsil with a vulsellum forceps and the attachment severed by slowly turning the thumb ring of the snare. The tonsil is immediately placed into a sterile bottle for cultural study and for vaccines.

As soon as the tonsil is out the anesthetist grasps the jointed end of the catheter, corresponding to the side from which the tonsil was removed, and pulls firmly outward and backward, thus bringing the two pillars in close proximity and making a tonsillar pocket which retards the flow of blood sufficiently long to permit the operator to seize a gauze sponge with a Tuffier's or Ellis forceps and place it into the pocket, where it is held by the forceps grasping the two margins of the pillars (Figure 11). The size of the sponge is determined by the size of the cavity present after the tonsil is removed and the amount of bleeding. Great care should be exercised not to overfill the cavity, and in trying to lock the sponge in with the forceps to exert too much pressure and to injure the pillars. Any and all the blood that is escaping into the pharynx is removed by the suction apparatus guided by an assistant.

If in spite of the sponges bleeding continues for more than a half minute, the sponge is removed and attempt made to find the active bleeding point. By grasping separately the anterior and posterior pillars with Wild's forceps which hold well yet cause no injury, the entire cavity can be explored and

the bleeding vessels easily caught by means of artery forceps. After a few moments they may be removed, and if the bleeding continues the vessel is tied. It is especially essential that this should be done when the vessel is in the lower pole of the fossa, under which circumstances it can only be observed when the base of the tongue is thoroughly depressed on that side. The bleeding point should be seized with an Ellis pick-up forcep and lifted up so as to permit a fine silk ligature to be placed around it. Long threads should be used and the technic which general surgeons use in ligating vessels deep in the abdominal cavity should be employed. If the ligature should slip off, it may be secured by passing a fine needle and thread about the forceps.

If bleeding still continues, the additional precaution may be used of placing into the cavity a piece of rubber sponge about one-third the size of the cavity. (Formerly we employed gauze saturated with compound tincture of benzoin to prevent putrefaction, but now we use the rubber sponge without any medication on it, since no odor is present when the sponge is removed after twelve to twenty-four hours.) A silk suture is placed through the margins of the two pillars and includes a particle of the sponge to prevent it from slipping out. It is best to put the suture at the lower third, tucking the sponge into the supratonsillar fossa, thus preventing it from slipping out.

The same technic is employed on the opposite side. The left hand should hold the instrument. Some find this a little difficult at first. If the operator insists on using the right hand, it will be necessary to put the patient in the Rose position and to stand behind the patient, when removing the left tonsil.

Having completed the tonsillectomy, the postnasal space is explored by having the anesthetist draw outwards and backwards on both the catheters. It stands to reason that the exposure of this area is not so good when the sponges are within the tonsil fossæ as when these are empty. In children that is the case, because the sponges are seldom used and the view of the adenoids is particularly good. Adenoids are often seen on the posterior surface of the posterior pillars, a position in which they cannot be seen except by such thorough retraction of the soft palate. These lateral masses are invariably first attacked by means of the ring curette (Figure 12), on

account of the greater bleeding. The main mass of adenoids we usually take away in part with a Stevenson adenotome (modification of LaForce) and the operation finished with a Barnhill curette, employing a very gentle stroke and not attempting to remove the adenoids en masse, but rather in such small particles as will be sucked up and not obstruct the rubber tube of the suction apparatus. We always have a duplicate suction tube available in case a particle of adenoid tissue blocks up the tube. About this time a fair flow of nitrous oxid is given to the patient by the open method and the ether cut out. The remainder of the operation is done under open mouth gas anesthesia.

The nasopharynx being cleared of the adenoids, we press against this denuded area, which has often the appearance of a gouged out excavation, a firm gauze sponge mounted on an artery forceps. This is held there for a few moments and perhaps replaced two or three times until the active oozing is checked. If this does not occur, and if a definite bleeding point is seen, it is caught with one or two artery forceps, which are allowed to hang on for a half minute. While waiting for the patient to awaken we fold into the postnasal space a strip of gauze (known as a Mayo sponge) from six to eight inches long and two inches wide. Releasing the catheter which allows the soft palate to come down on this Mayo sponge, every particle of oozing is checked. When anesthetic is discontinued, and the patient begins to react, the anesthetist pulls once more on the catheters and the gauze is removed from the postnasal space. Before removing the catheters the anesthetist always wipes off their free ends with alcohol, since in pulling them out they must pass the operated field and might carry infection.

After-Care.—Great care is taken in the transfer of patient from operating room to his room to cover him thoroughly, because the body is usually wet from perspiration. The patient's bed, as after any other operation under general anesthesia, should be warm. The head of the patient should lie flat on the bed.

Sips of water may be given earlier than was formerly thought advisable, because the stomach is not filled with blood, and hence the patient does not vomit as readily. If sponges

are employed they are removed early in the afternoon, if the case is operated in the morning, and on the next morning if the operation was performed in the afternoon. By depressing the tongue and cutting the black silk thread with a blunt pointed scissors the pillars will separate and in most cases the rubber sponge will roll out. If not, then it may be teased out with the same scissors.

The diet in the first twenty-four hours consists of water, tea or milk. The mouth and throat should be gently rinsed with a weak solution of permanganate of potash solution as often as the secretions accumulate. The diet should be increased every day, but usually on the third or fourth day the difficulty in swallowing is greater than at first, due to the infiltration, which is best managed by the application of tincture of iodine to the tonsillar wounds.

Under Local Anesthesia.—(a) The patient is asked to eat as usual, and under no circumstance should he submit to operation on an empty stomach, even though the patient may gag and vomit up the meal. This is not on account of the lesser toxicity from cocaine, but because starvation weakens the patient somewhat. Morphine and atropine are usually given hypodermatically.

(b) The patient is put in a sitting posture. The whole nasopharynx and hypopharynx are swabbed with a solution of adrenalin 1/1,000. This is followed with the careful application to all these parts of pure flake cocaine. The nasal cavities are also cocaineized in the inferior meatuses, as rubber catheters may be used.

(c) The patient is now placed on a table in a semireclining position and an injection of about ten minims of a one-half per cent solution of novocaine is made in the vicinity of the sphenopalatine foramen, by way of the mouth, thus further blocking the sensation. He is then given a towel to expectorate in, so as to obviate the necessity of rising and disturbing the whole field of operation. Use is made of the suction apparatus. The operative technic is the same as when under general anesthesia, except that a great deal more effort is required to raise the tonsil into the supratonsillar fossa, and the technic is more difficult on account of the nervousness and gagging of the patient. In some of these cases it is not possible to introduce the catheters until the tonsil has been removed.

Dissection Operation.—(1) The same general or local preparations of the patient are employed as in the other operations.

(2) After the catheters are passed through the nose the tonsil is grasped by means of a vulsellum forceps and drawn towards the median line. A small incision with the writer's knife (Figure 13) is made at the superior pole of the junction of the tonsils and plica supratonsillaris down on to the capsule. With the same knife this incision is extended anteriorly and posteriorly along the two pillars. By means of Mayo's curved scissors (Figure 14) the tonsil is further freed from its attachment, always putting on an artery forceps before severing the attachments near the base. When the tonsil is free on all sides it is released from the vulsellum and surrounded by the tonsillectome and grasped again by the vulsellum, then is pulled through the ring, being sure that the lower pole is included. The wire loop is now released and drawn down, severing the remaining attachments. The management of the tonsil cavity is the same as described before.

As said before, the dissection operation is performed only when we cannot dislodge the tonsil completely by means of the tonsillectome, whether under local or general anesthesia.

I have gone over many of the points in detail advisedly, although most men doing tonsil work are familiar with the required technic, the great majority of operators will adopt the technic which they can best master and by which they secure the best results.

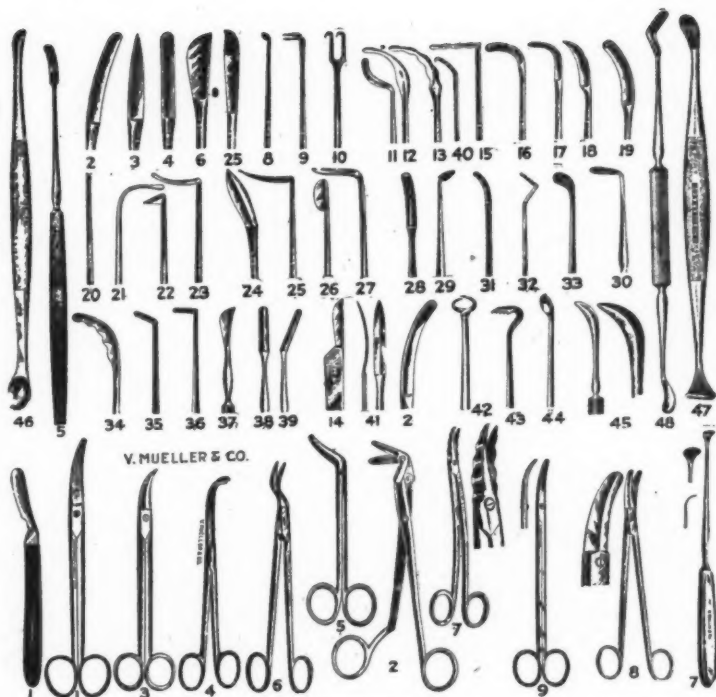
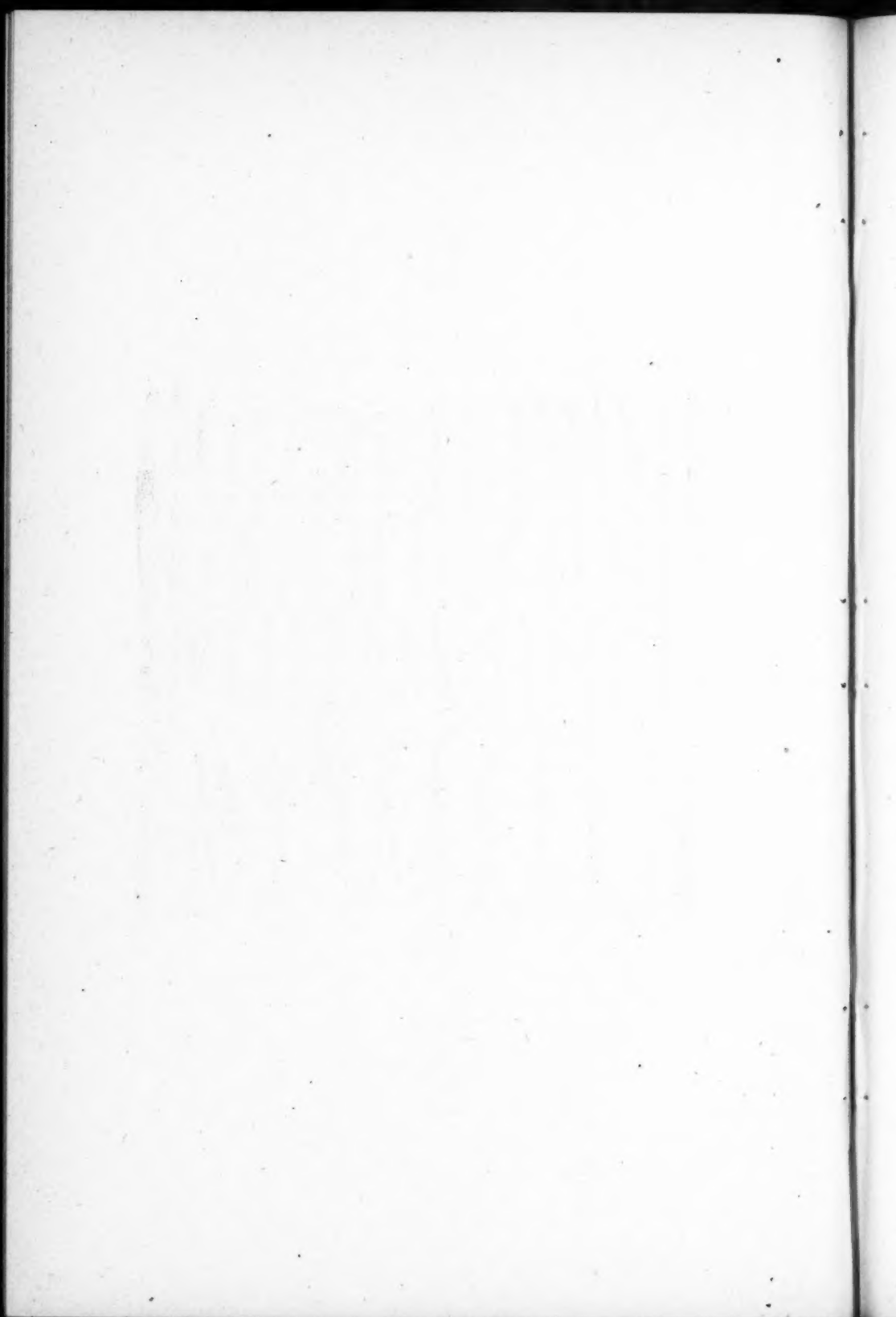


FIGURE 1.



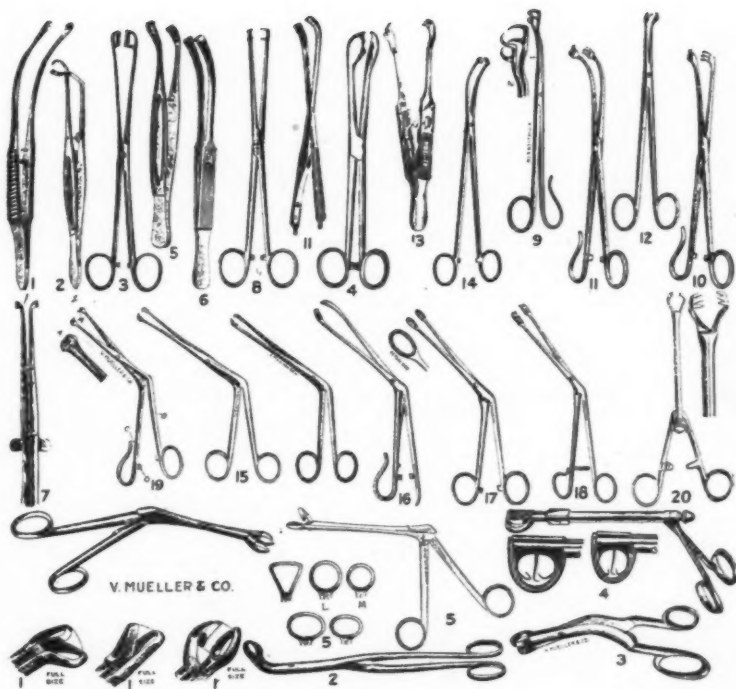
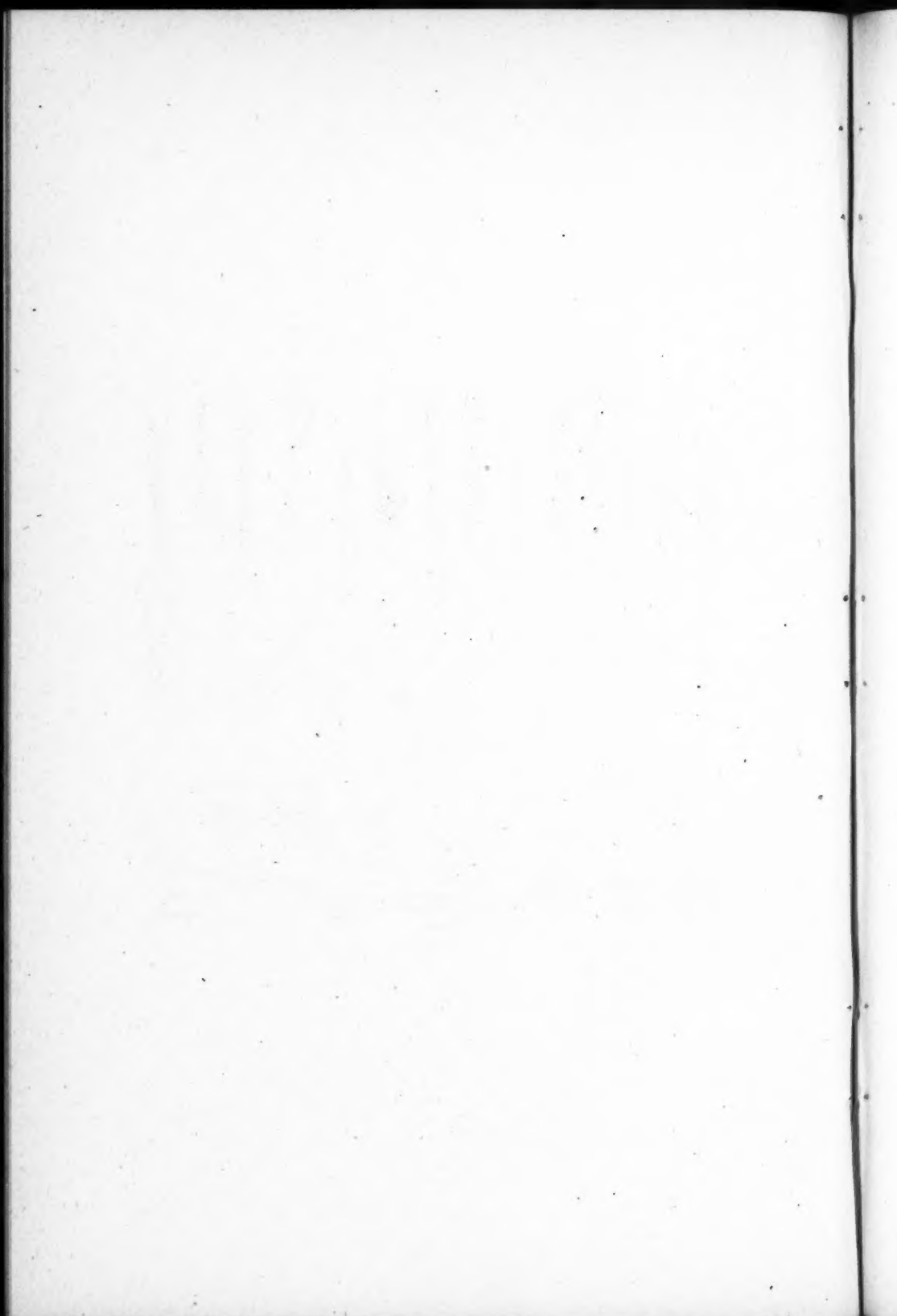


FIGURE 2.



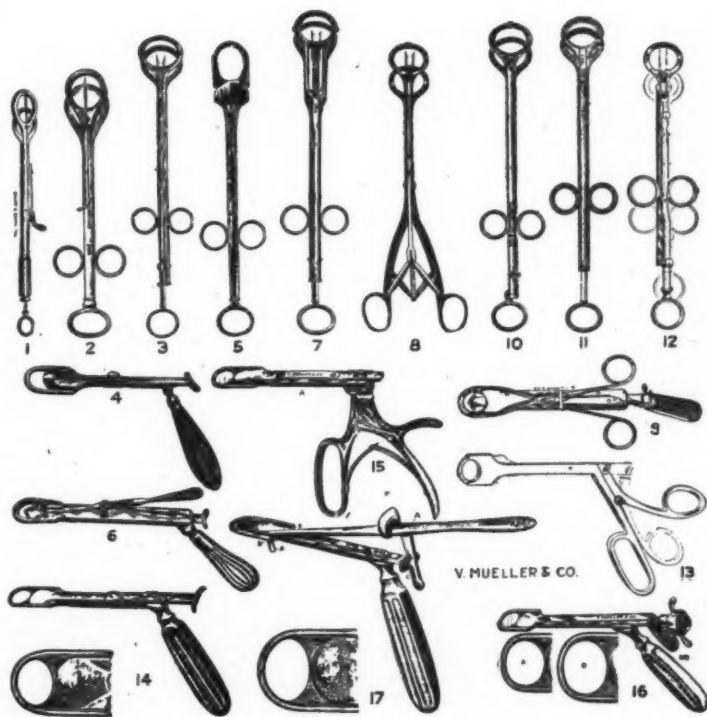
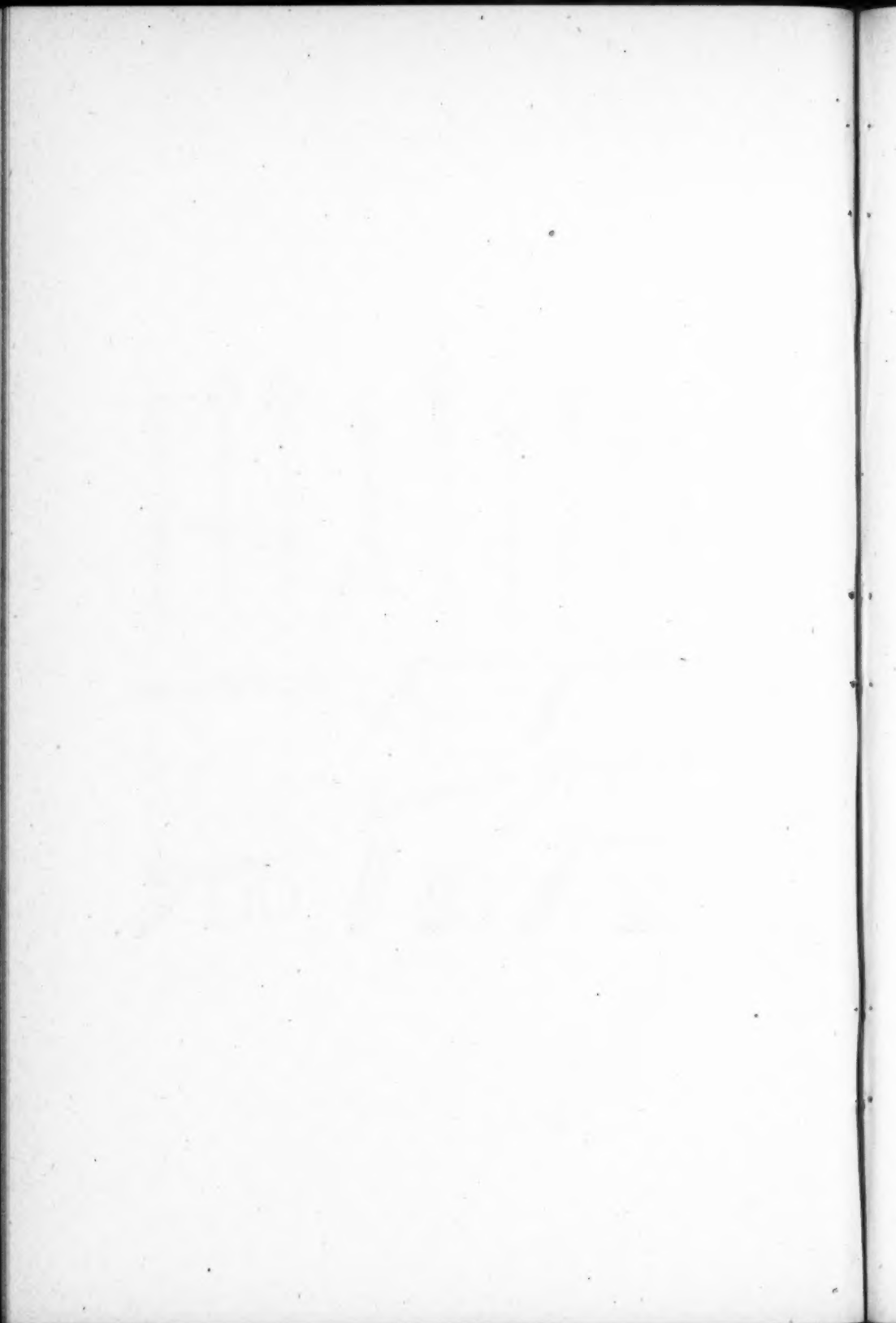


FIGURE 3.



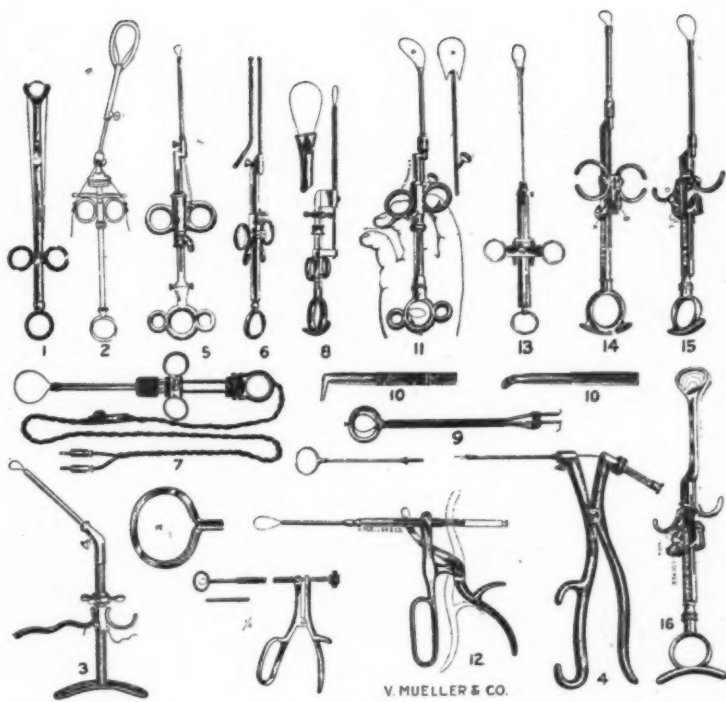
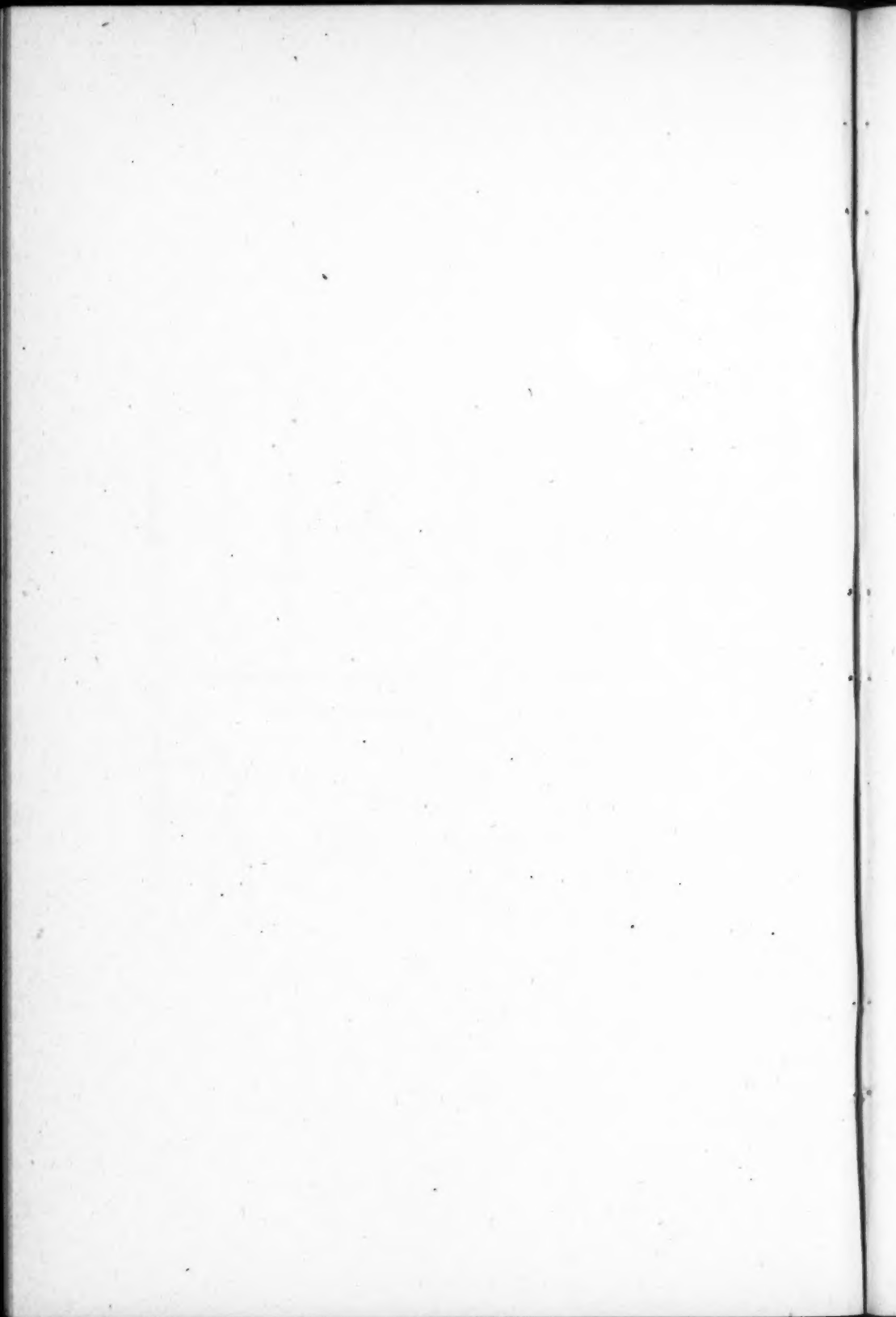


FIGURE 4.



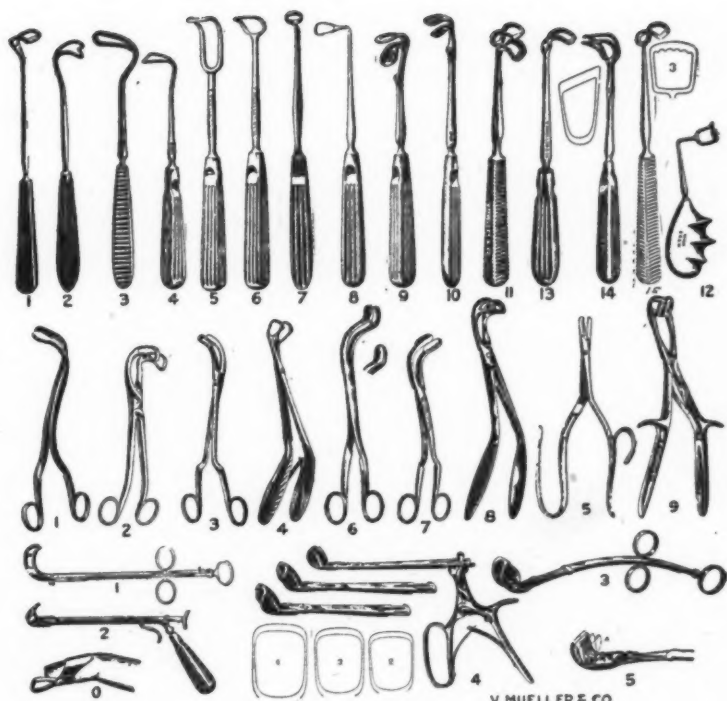


FIGURE 5.

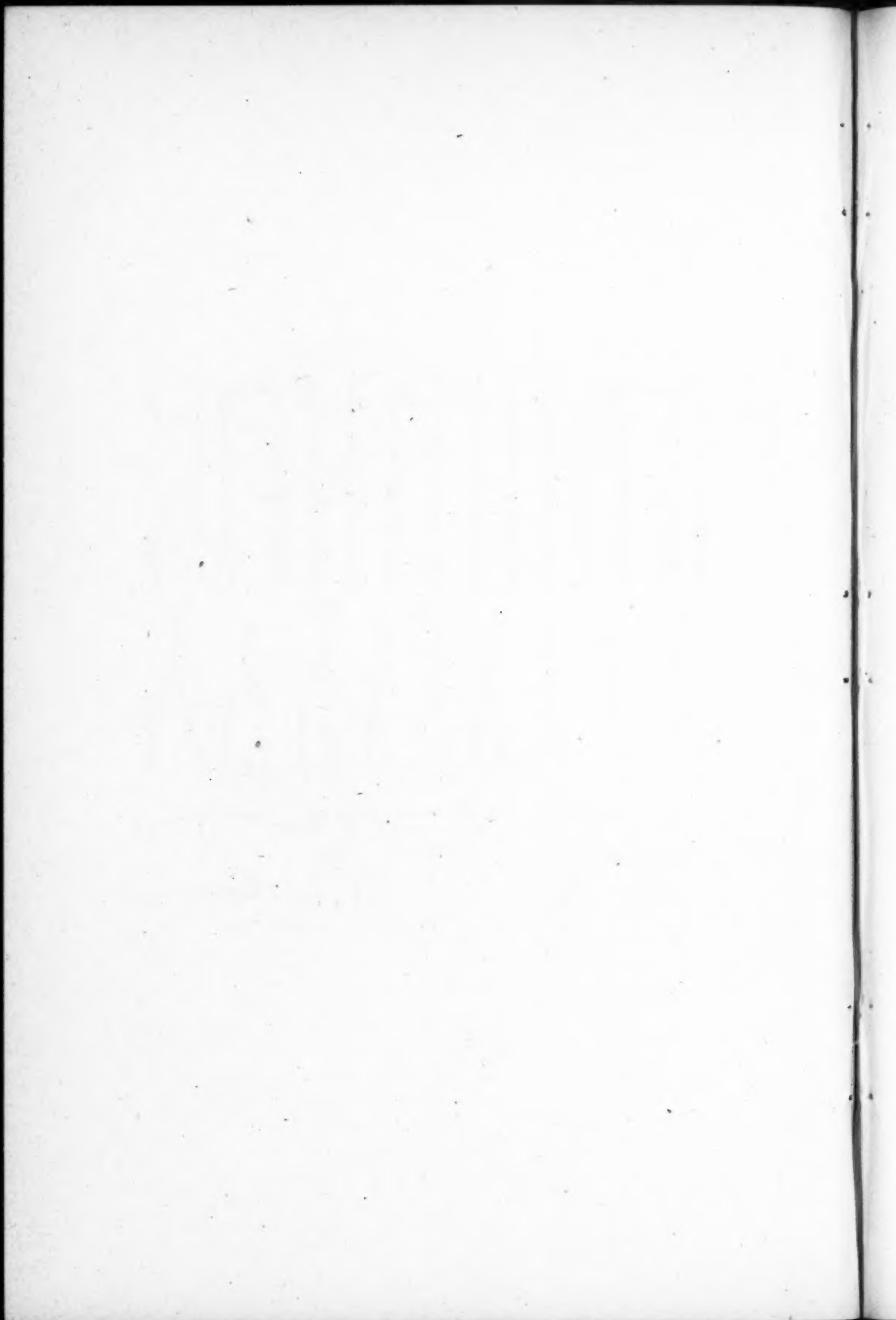




FIGURE 6.

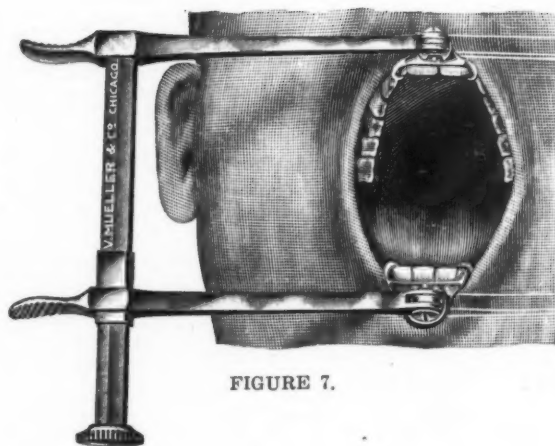
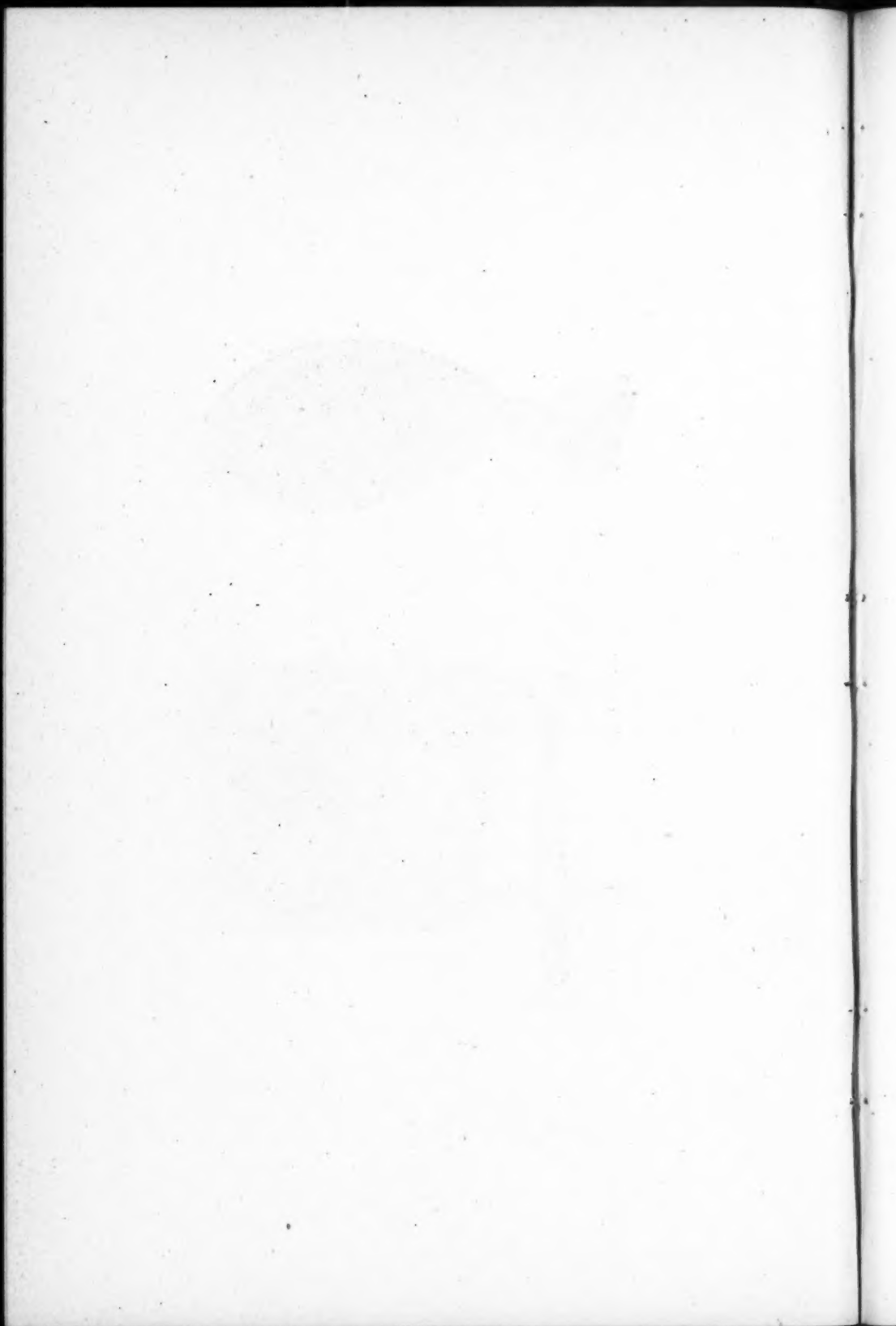


FIGURE 7.



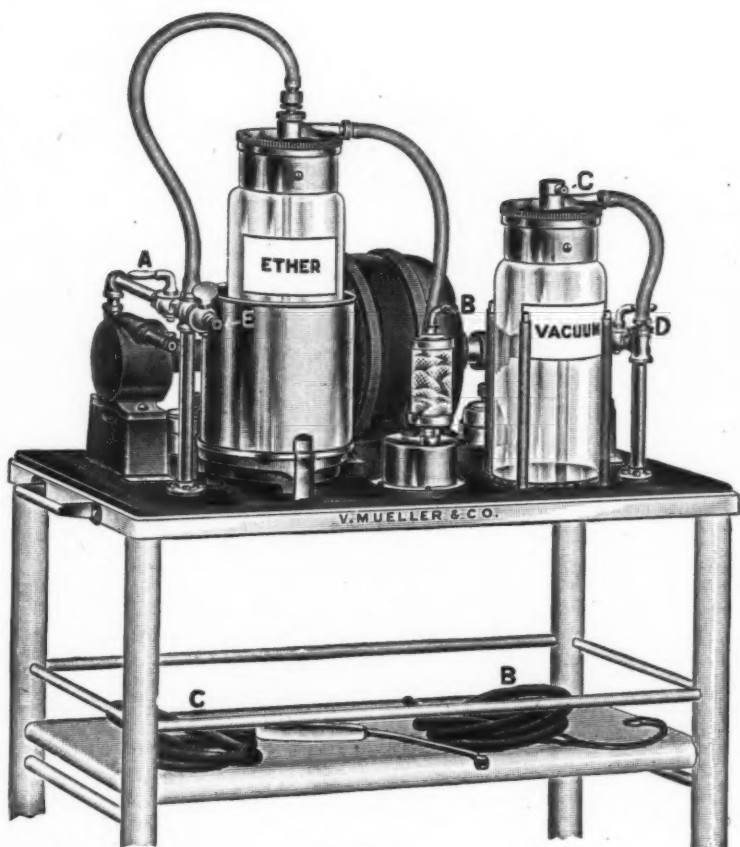


FIGURE 8.

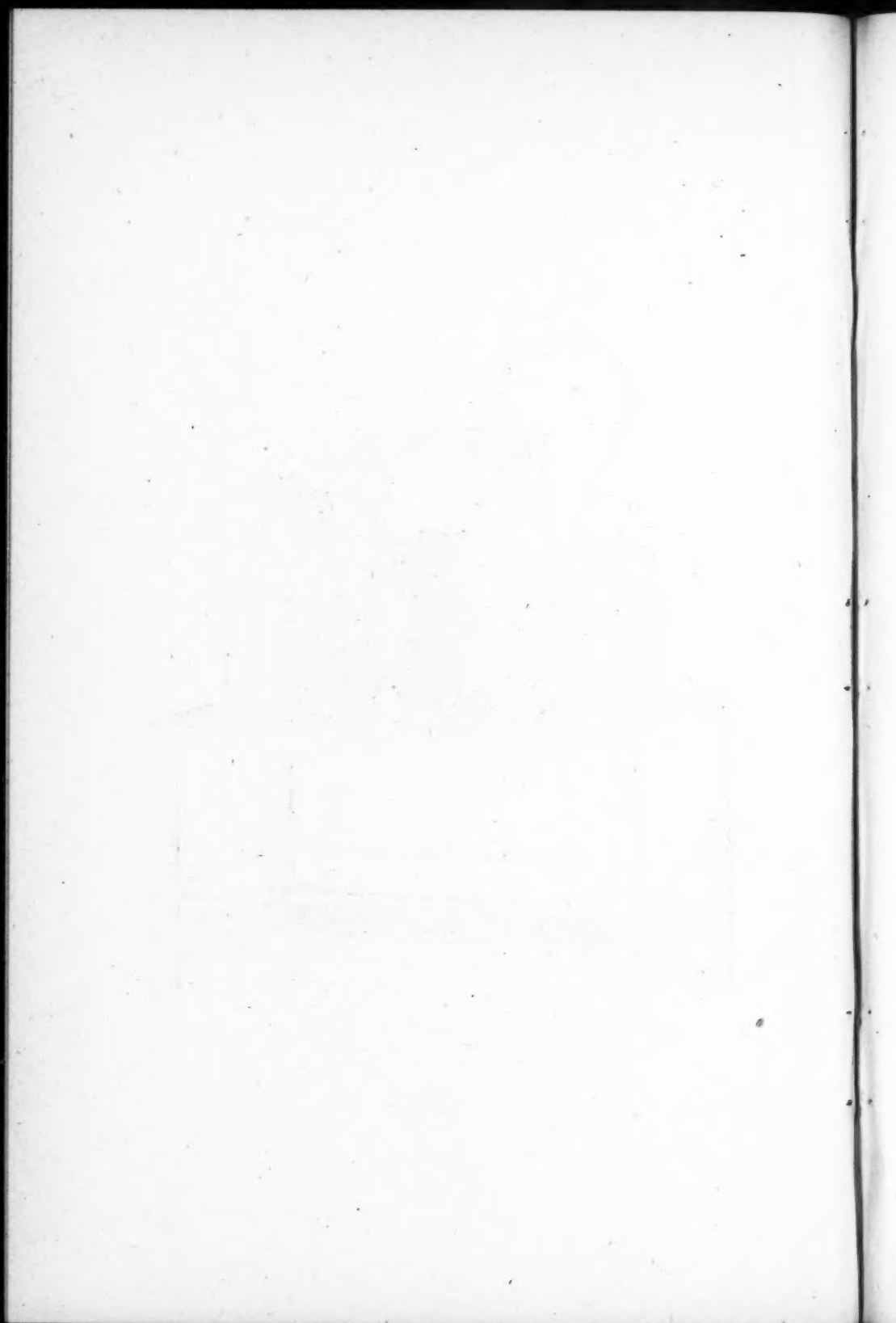




FIGURE 9.

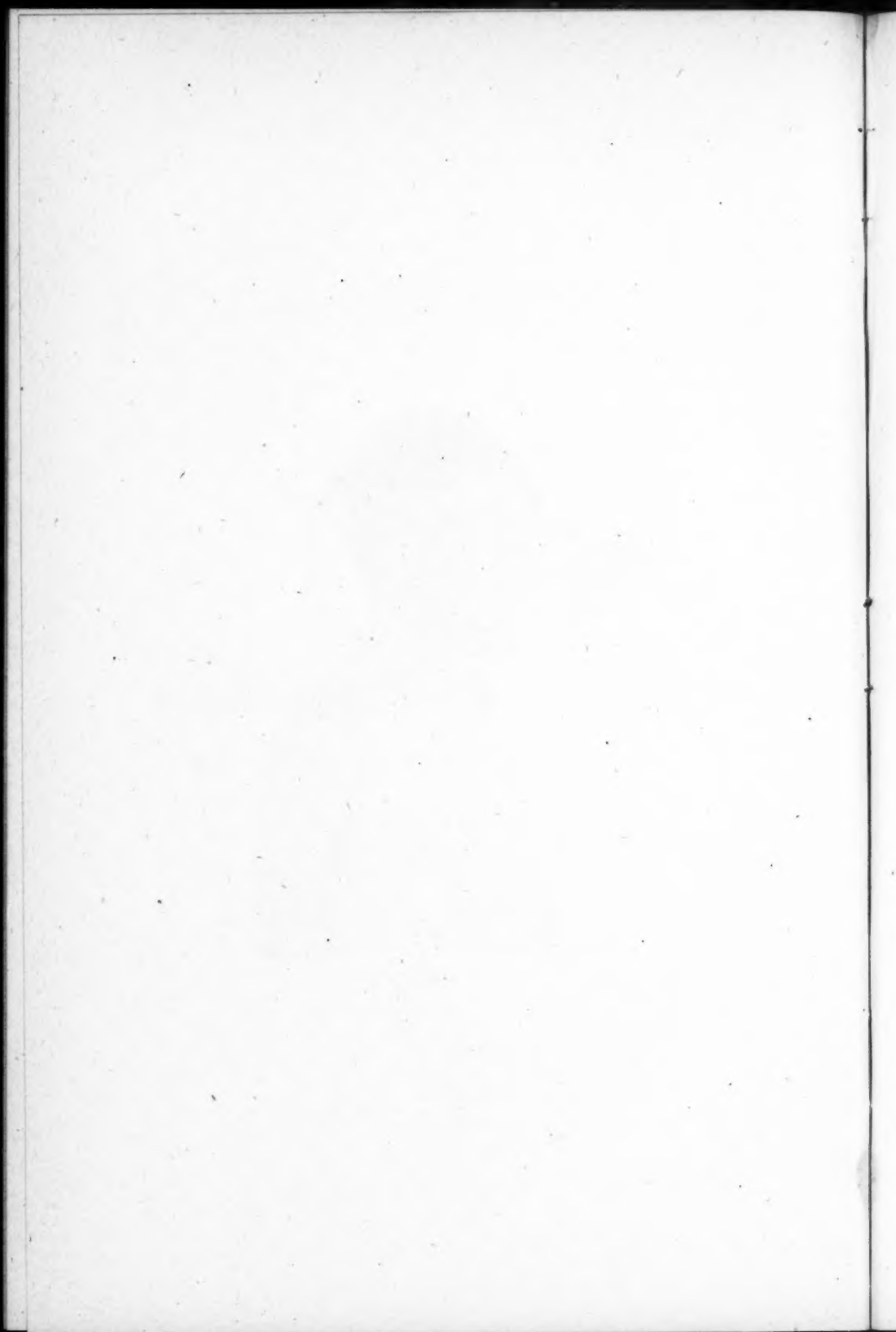




FIGURE 10.



FIGURE 11.



FIGURE 12.



FIGURE 13.

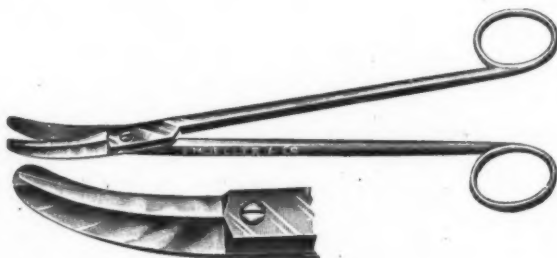
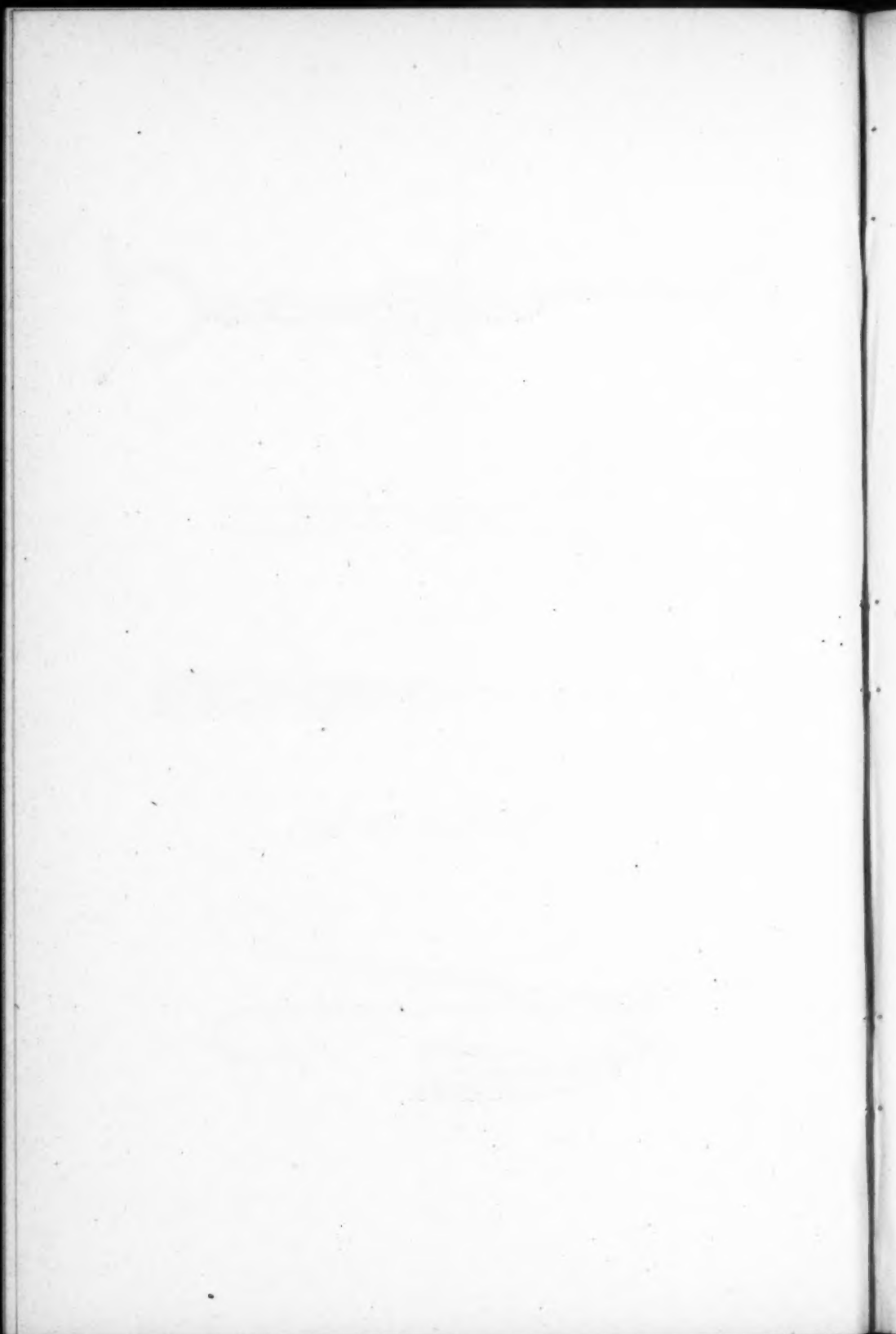


FIGURE 14.



XV.

DIAGNOSIS OF INFLAMMATORY DISEASES OF
THE LABYRINTH.*

BY JOHN B. RAE, M. B., C. M.,

NEW YORK CITY.

Any discussion of the symptomatology of inflammatory conditions of the labyrinth should now call for some definite method of classification. There are two such conditions whose identity is well established, and they may very well serve as a starting point from which other conditions may be approached whose exact classification may still be considered as open to debate.

The first of these is acute diffuse labyrinthitis. This is one of the conditions which was responsible, and rightly so, for the introduction of the qualifying term "manifest." A "manifest" labyrinthitis is one in which the patient exhibits spontaneously symptoms which can directly be referred to the labyrinth.

The second is the dead labyrinth, the result of chronic diffuse suppuration either still active or residual, and is the type to which the term "latent" has been applied in contrast to the "manifest" type. In the latent type the hearing is quite lost and the vestibular function is completely ablated. The same clinical picture will be presented when the patient under examination has been subjected to the complete labyrinth operation.

The chronic diffuse or latent type is the terminal stage of the acute diffuse type, and the progress from the one to the other may be extremely rapid. Acute diffuse suppuration of the labyrinth will completely and permanently destroy the end organs of both the cochlear and vestibular branches, so that within a few days, or at most a few weeks, the two conditions can only be clinically differentiated by the reaction to turning and by the galvanic tests.

*Read at the annual meeting of the Medical Society of the State of New York at Saratoga Springs, May 16, 1916.

When we come to consider the so-called "circumscribed" cases, we enter upon debatable ground. It is impossible to conceive that any active suppurative process beginning, for example, at a break in the labyrinth wall in the neighborhood of the horizontal canal and really invading the endolymphatic spaces, should remain circumscribed. On the other hand, in such cases, that is those of fistula in the horizontal canal, it is a matter of common clinical observation that these patients present spontaneously at intervals, symptoms which undoubtedly are referable to the vestibular apparatus and which at first glance would bring them under the "manifest" type. But on examination we find them to possess hearing, and the vestibular function is not only maintained, but is abnormally sensitive to experimental stimulation. On the subsidence of the attack, these patients present clinically the appearance and tests of the ordinary chronic middle ear suppuration.

In another class of cases also, the subjects of chronic suppurative otitis media, but without a fistula, similar vestibular attacks occur. This similarity is very striking. In both varieties there is undoubtedly at the time of such attacks a disturbance of pressure within the labyrinth. This may be vascular in character, amounting perhaps to serous effusion, and due to local changes outside of the labyrinth. On restoration of normal pressure conditions the status of the patient is exactly as it was before the attack. Both of these types have one feature in common. They are both the subjects of chronic middle ear suppuration, often of long duration, and are both very liable to have bony changes in the antrum, mastoid cells and aditus ad antrum. They differ only in that in the fistula case, such bony destruction can be demonstrated; while in the other, such a condition is not capable of clinical proof.

The writer, in accordance with the views briefly mentioned, ventures to suggest that we would be advancing the cause of more exact classification if in the meantime we entirely omitted the use of the term "circumscribed" labyrinthitis, and if in its place we described these cases as peri- or paralabyrinthitis with or without fistula.

It will be observed that the further qualifying terms "serous" and "suppurating," as applied to labyrinthitis, have so far not been mentioned. In the very earliest stages these forms can-

not be differentiated. Indeed, the serous variety is very likely the first stage of the purulent. The general statement may be made that the case which progresses rapidly to destruction of both hearing and vestibular functions is a purulent case, whilst that which runs a less acute course and terminates in resolution with more or less restoration of function has been of the serous type. In other words, the diagnosis is made on the results and not on the evidence.

This brief allusion to classification will lead us to consider the symptomatology of the following types: (1) Acute diffuse labyrinthitis, (2) chronic diffuse labyrinthitis, (3) peri- or paralabyrinthitis with fistula, and (4) peri- or paralabyrinthitis without demonstrable fistula.

(1) Acute diffuse labyrinthitis.

Acute diffuse labyrinthitis occurs in the course of acute or chronic otitis media. In the former case infection is most likely metastatic, with a resulting empyema of the labyrinth. In the latter case the labyrinth is most commonly exposed to infection by extension of bony caries. In both cases the course is similar. The onset is sudden and the urgent symptoms are referable to the vestibular apparatus, namely, vertigo with nausea and vomiting, disturbances of equilibrium and spontaneous nystagmus. The vertigo is intense, so that any movement of the patient may determine a violent attack of vomiting, and the disturbance of equilibrium is such that he is unable to walk. The nystagmus is most commonly rotatory in type, is to the affected side, and is to be observed in all positions of the eyes, most markedly, however, an abduction in the direction of the quick component.

Should the patient be made to stand erect, it can be observed that he will tend to fall in a direction opposite to that of the quick component of the nystagmus, and that the direction of falling can be changed by changing the position of the head.

It is obvious, however, that the patient is in no condition to be removed from bed, and the writer wishes to reiterate and emphasize the statement he made in a paper read before the American Otological Society in 1912, namely, that the spontaneous evidence in these acute cases is so informing and convincing that we are in no need of experimental testimony in

addition. Accordingly, such patients need never be subjected to caloric and rotation tests. In plain English, during the acute attack, so long as the spontaneous nystagmus is to the diseased side, the vestibular apparatus on that side is functioning and no further information can be gained by subjecting this sick patient either to the caloric or rotation tests.

Should nystagmus to the bad side cease and nystagmus to the good side begin, this in itself is presumptive evidence of the destruction of the diseased end organ, especially when associated with loss of hearing. Caloric tests can now be made without much added discomfort to the patient, but will give no further information of real value.

The symptoms so far have only referred to the vestibular apparatus, and on this evidence alone the case could not be called a "diffuse" one. The functional examination of the hearing is of absolute importance. In the earliest stages the result of the hearing test is determined by the middle ear condition. The patient is deaf for the low notes, hears the high notes, has increased bone conduction, Rinne is negative, and the Weber is referred to the bad ear. With destruction of the end organ of the cochlear branch total deafness ensues. This must be determined when the hearing ear has been carefully excluded by means of a suitable noise apparatus. The hearing tests should be repeated at short intervals, because it is only when we discover total loss of hearing in conjunction with a complete lack of vestibular function, that we are able to make the diagnosis of a "diffuse" labyrinthitis.

With the destruction of the end organ of the vestibular nerve, nystagmus to the sound side is to be observed and is to be explained by imbalance of centers by the sudden cessation of impulses from one peripheral organ.

This nystagmus is also accompanied by vertigo and disturbances of equilibrium, following the rule as described for the primary nystagmus. Should no complication arise, these secondary symptoms gradually subside, and in a longer or shorter period, when balance of centers has been reestablished, are not to be observed at all.

This is the course, in general, of acute diffuse suppurative labyrinthitis. Should the process have been serous in character without destruction of end organs, complete loss of hearing does not result at any stage, nor do the secondary vestibular phenomena attributable to the center on the good side arise. With the subsidence of the inflammatory process, hearing returns more or less to its previous condition and the vestibular apparatus is gradually restored. In process of restoration nystagmus is irregular to either the good or the bad side.

A variety of labyrinthitis has been described under the name of "acute diffuse secondary labyrinthitis," and has at least in some instances been attributed to trauma arising from the performance of the radical mastoid operation. It has been the experience of the writer, and of those of his colleagues with whom he has discussed it, to meet few if any of these cases, and as the course of this variety does not differ in any way from one or other of the forms already described, it does not seem needful to complicate the classification by its addition.

It seems proper at this point to repeat that the serous and purulent variations cannot be differentiated at the outset by any means known to the writer. The rapid progress and early destruction of the end organs on the affected side undoubtedly point to the purulent type. Lack of these would seem to indicate the serous type.

Following acute diffuse suppurative labyrinthitis there is, it is hardly necessary to note, no restoration of either cochlear or vestibular function. The case gradually passes into the second group to be described, namely:

(2) Chronic diffuse labyrinthitis.

These are all cases of chronic purulent otitis media, either active or residual, and must presumably at some time have passed through the acute stage described above. It is quite likely, however, that no such history may be obtained from the patient, and this need be no source of surprise, if we reflect that many of these chronic diffuse labyrinths are the result of a panotitis, occurring in early childhood in the course of an attack of scarlet fever, measles or diphtheria.

This condition is usually discovered in the routine examination of chronic purulent otitis media cases, and the diagnosis is as a rule without difficulty. Hearing is entirely absent

on the affected side, and the vestibular apparatus is not irritable on irrigation of the ear with cold or hot water. The patient does not suffer from vertigo, there is no spontaneous nystagmus, nor is there any disturbance of equilibrium.

When compensation has been fully established, the after-nystagmus on rotation may be equal in both directions. But while rotation nystagmus can practically always be obtained both to right and left, it is a matter of observation, especially in recent cases, that the after-nystagmus to the diseased side may be considerably shorter than to the sound side.

This brings us to the third class of cases, namely:

(3) Paralabyrinthitis with fistula.

These for the most part also occur in the course of chronic suppurative otitis media, especially in the experience of the writer, when the suppurative process is complicated by the presence of so-called cholesteatoma.

Erosion by caries of some part of the labyrinthine capsule takes place. This is a slow procedure, and permits of the walling off, by adhesions at the point of exposure, of the perilymphatic space. It might be described as a limited endosteitis.

The commonest location of erosion is in the horizontal canal as it lies in the aditus. In this locality the carious process may also involve the fallopian aqueduct with an added facial paralysis. This combination of positive fistula symptom accompanied by facial paralysis almost certainly locates the fistula in the horizontal canal. Indeed, with a dead labyrinth in which no fistula symptom could naturally be obtained, the writer has been able to deduce, and later prove on operation, the presence of a fistula in the horizontal canal by the onset of facial paralysis.

The next most common seat of erosion is in the neighborhood of the oval window, and the least frequent in the promontory. It is impossible, however, to determine exactly the site of the fistula in many cases before operation. The patient who is the subject of a labyrinthine fistula suffers at intervals from symptoms due to irritation of his exposed vestibular apparatus. As already stated, it is the opinion of the writer that these are by no means the expression of a true labyrinthitis, but are rather determined by alterations in intralabyrinthine pressure due to conditions outside the labyrinth.

These symptoms vary only in intensity and frequency from those which mark the onset of any diffuse inflammation of the labyrinth, and consist of vertigo, disturbances of equilibrium and spontaneous nystagmus. It is when we come to make our cochlear examination and apply our experimental vestibular tests that the differential diagnosis is made.

The hearing tests show the lesion to be confined to the conducting mechanism.

The compression and aspiration tests prove the presence of a fistula in most cases. It should not be forgotten, however, that even when we are dealing with a fistula—as may be subsequently proved on operation—this test may be negative. The defect in the canal may be so blocked off by granulation or cholesteatomatous material as to prevent any pressure changes occurring during the experiment. Should we on compression obtain some coarse nystagmic movements, a conjugate deviation of the eyes in one direction, with or without head movements, and should we also obtain on aspiration a conjugate deviation of the eyes in the opposite direction, the diagnosis of labyrinthine fistula may be made. In addition, we are now satisfied that we are dealing with a functioning vestibular apparatus, as it is very evident that were the vestibular end organ destroyed, we should not be able, even with a fistula, to convey any impulses to the vestibular nuclei. In other words, a dead labyrinth with a fistula will not give us a positive test.

After a shorter or longer period, from a few hours to a few days, these symptoms subside, and the case is not to be distinguished, unless experimentally, from the ordinary chronic suppurative middle ear.

The caloric reactions are usually very readily obtained, unless, as previously stated, the labyrinthine capsule is blocked off by granulation or cholesteatoma. The turning tests confirm the presence of irritability of the vestibular apparatus.

To sum up, in this type we have to deal with a patient suffering from chronic suppurative otitis media, with changes in the bone in the aditus, antrum or the mastoid cells, with a break through some part of the labyrinthine capsule, with a functioning vestibular apparatus, and whose hearing defect is limited to the conducting mechanism.

(4) Paralabyrinthitis without fistula.

This type is exemplified by the patient who suffers from chronic suppurative otitis media, who is subject at intervals to attacks referable to the vestibular apparatus, who is presumably suffering from bony changes affecting the aditus, antrum or mastoid cells, and whose hearing lesion is confined to the conducting mechanism. He only differs from the previous type in that we are unable to obtain a positive fistula test. That we find many of these cases without fistula has been repeatedly proved on operation.

The caloric and rotation tests also prove the irritability of the vestibular apparatus.

It will be apparent that no attempt has been made in the above brief remarks to go into the constitutional symptomatology of labyrinthine inflammatory conditions. The writer takes it for granted that his hearers are familiar with the experimental methods named, and has made this contribution solely in the hope that discussion of this important and interesting subject will result in a simplification of the classification, at this moment cumbersome and complicated.

CLASSIFICATION.

1. Acute diffuse labyrinthitis.
2. Chronic diffuse labyrinthitis.
3. Paralabyrinthitis: (a) with fistula; (b) without demonstrable fistula.

XVI.

THE TREATMENT OF LABYRINTHINE AFFECTIONS.*

BY WENDELL C. PHILLIPS, M. D.,

NEW YORK CITY.

The treatment of the various affections of the labyrinth, and more especially that of the purulent invasions of this small space, has not, up to this time, been placed upon any permanent basis. The difficulties of differential diagnosis, and the fact that we know that many cases of purulent labyrinthitis recover spontaneously, even where a part or whole of the labyrinthine capsule becomes necrosed, lead to a wider divergence of opinion regarding the exact indications for operative interference. On the other hand, we must admit that there are cases where it is possible to save life by timely operative procedure. In the present state of our knowledge it would seem that at least a moderate degree of conservatism should rule the action of the surgeon, except in cases that already show the infection to have passed through the labyrinthine spaces into the meninges.

In the preparation of this short paper the writer has before him histories of thirty-six cases of the various types of labyrinthine invasions. Twenty-six of these cases have already been published, the types varying from the destructive lesions of parotiditis and tertiary syphilis to those of acute diffuse labyrinthitis. Out of the thirty-six cases there were fourteen operations upon the labyrinth, seven of which were for the removal of the extensive necrosis or sequestra in patients who had long since passed the acute stage of the disease. This leaves a record of seven operations for more or less acute labyrinthitis. There were five fatalities. One of the fatal

*Read at the annual meeting of the Medical Society of the State of New York at Saratoga Springs, May 16, 1916.

cases occurred in my own practice from the rupture of a temporosphenoidal abscess and meningitis two months subsequent to the labyrinth operation. This patient might have been saved had he shown any symptoms, barring headache, of the large brain abscess from which he suffered. In two of the fatal cases no operation upon the labyrinth was performed. One of these cases was drained through the cisterna magna, and the other was rapidly fatal, and no operation was attempted. In one case, which recovered, a thrombus in the jugular bulb developed as the result of an accidental puncture while removing the necrosed promonotory. Two others had accompanying brain abscesses.

Primarily, it may be stated that the indications for operation depend upon the type of labyrinthine involvement. Non-suppurative cases resulting from parotiditis, hemorrhage or other effusions, and epidemic cerebrospinal meningitis, should never be subjected to operation. The labyrinth should not be operated upon in cases of serous labyrinthitis, and herein lies one of the difficulties with which we have to contend—namely, the differential diagnosis between certain cases of serous labyrinthitis and purulent labyrinthitis. In both, the destruction of the cochlea and the static labyrinth may be complete and permanent, and we are without positive differential data, barring our knowledge of the probable cause in each individual case. Complete destruction of function, however, is less likely in the serous cases. Whenever any doubt exists as to whether the case is purulent or serous in character, the patient should be given the benefit of the doubt and the operation delayed, pending further developments.

Regarding the indications for the labyrinth operation in acute diffuse labyrinthitis there is bound to be a wide variance in opinion. Its development in chronic suppurative cases seems to be more gradual, and these cases offer more hope of becoming circumscribed, and hence they are less likely to develop meningeal complications. The seven cases of necrosis or sequestra above reported seem to be confirmatory of this opinion, for they were all cases of chronic suppurative otitis media. On the other hand, it is well known that in acute diffuse purulent labyrinthitis accompanying acute purulent otitis media the infection usually extends rapidly to the meninges,

and in these cases early surgical measures seem to be justified. Even though meningeal symptoms have already appeared, a complete labyrinth operation should be done, together with the establishment of drainage of the meninges at, or near, the internal auditory canal. This operation, together with the drainage of the meninges, has proven effective in a limited proportion of cases of labyrinthine involvement with meningeal complications. It would seem that the recoveries are due to the more or less localized character of the meningitis, hence the meningeal drainage would seem to be a more important factor than the operation upon the labyrinth.

I am indebted to Dr. C. J. Imperatori for the following history of recovery from an undoubted meningeal involvement as a result of purulent labyrinthitis. This case, however, occurred in a patient who had suffered from chronic purulent otitis media for many years.

Miss M. P., aged thirty-nine years.

Past History.—Had mostly all diseases of childhood. Measles when twelve years old, which left her with an otitis media purulenta chronica left; otherwise her past history is negative.

Family History.—In so far as present condition is concerned is negative.

Present History.—Three weeks ago began to have severe headaches, mostly frontal and occipital, and noticed as her headaches increased in severity the amount of urine passed lessened, so that on May 4, 1915, when she entered the Park Hospital, she was passing but a few ounces of urine. She was entered in the medical ward, and tentatively considered a case of beginning uremia. At this time she was in a more or less stuporous condition, refusing to answer questions regarding her past history, and always rambling off on some irrelevant subject. She had some rigidity at the back of the neck, and lumbar puncture was done, and because of the variety of bacteria within the spinal fluid the pathologist remarked that the fluid seemed to come from one suffering from otitic meningitis. At this, one of the internes said he remembered she had a foul smelling discharge from her ear. On May 6th, Dr. Imperatori was asked to see her. Examination showed the patient lying in a stupor, from which she could be aroused

and would answer questions fairly intelligently. There was decided cervical opisthotonos, but no Kernig, no Babinski, no Gordon nor Oppenheim. The other reflexes were decidedly suppressed, and there was a rotatory nystagmus to the right. She was tender over the left mastoid, and she had a very offensive discharge from the external auditory canal. There was some granulations at the bottom of the canal, but no drum or ossicles could be made out. Functional testing of the right side showed an active labyrinth. Caloric reaction within twenty seconds with water at 65 degrees Fahrenheit. Syringing the left side with water at 50 degrees produced no reaction within eight minutes. With a noise apparatus in the right ear there was no response to the voice, tuning forks or whistle. With a 256c tuning fork the patient lateralized to the right side—that is, her sound side. The eye grounds showed some paleness of the nerve vessels, with a slight atrophy of the nerve. Motility of the eyes was normal. The examination of the spinal fluid showed two hundred and fifty cells, and the variety of the bacteria being so numerous that the pathologist could not make a report from a smear diagnosis. Culturally he was able to recover streptococcus from the fluid. Operation was advised, but the family refused permission. On May 9, 1915, the patient was unconscious and could not be aroused and had all signs of terminal meningitis. Finally, the family and also the doctors gave permission: "Do your old operation, she is going to die any way," is what they said.

Operation.—Preliminary lumbar puncture showed a moderately cloudy fluid (three hundred cells) with a pressure of twenty degrees Strauss instrument. The usual radical operation without cutting a flap was done, and this was immediately followed by a Jansen-Neumann operation upon the labyrinth. The dura was incised at the internal auditory orifice. The sinus was situated very far forward, and made the latter phase of the operation somewhat difficult. The patient was returned to the ward, and by the next morning, May 10th, was semi-conscious at intervals, and by the 18th of May was conscious and rational. A lumbar puncture was done twice on May 10th removing twenty-five cubic centimeters of fluid each time. On May 11th, thirty cubic centimeters of fluid was removed; on May 12th, thirty cubic centimeters, and on May 13th, thirty

cubic centimeters. Pressure of the spinal fluid varied between sixteen and thirty degrees, the cloudiness gradually disappearing from the fluid. The cerebrospinal fluid drained considerably through the mastoid wound for the first few days. By the 3d of June she was in very good shape, having regained full control of her sphincters. The quantity of urine gradually increased until the usual normal amount was passed. A plastic closure was done, and by the 1st of October there was complete epidermization of the radical cavity. The patient was able to walk alone by the 15th of July, using a cane, but there was a slight staggering gait. This completely disappeared. She has a facial paralysis on the operated side. The writer has known of another similar case.

It is not to be expected that recovery will take place in the large proportion of cases, but the fact that the meningeal infection may occasionally be more or less localized offers sufficient encouragement to warrant this attempt to save life. In these desperate cases no half-way measures are permissible, and the Neumann operation, wherein the bone is entirely removed, including the border of the internal auditory canal, together with drainage of the cerebellar spaces, is the ideal procedure.

In two cases out of the thirty-six the labyrinth symptoms resulted from traumatism at the hands of inexperienced operators while incising the drum membrane. Dr. J. H. Guntzer has reported one of these cases: On May 31, 1915, was called by the family physician to see M. K., male, thirty-one years old. Found the patient in bed lying on his left side. History of pain in right ear for two days; no discharge. Since the previous evening was unable to walk, felt dizzy and vomited. Examination of the right ear showed the membrana tympani slightly reddened, no bulging and a pinhead perforation about the center of the superior posterior quadrant with a droplet of serous red discharge exuding. The patient had a spontaneous horizontal nystagmus to the left and rotary on looking up; on attempting to rise, fell toward the right. Hearing was not impaired, no mastoid tenderness, no temperature, pulse 88. Diagnosis of labyrinthine irritation was made, but no assignable cause could be elicited. Calomel and sodium bromid were recommended, rather as placebo. This condition lasted

ten days before the patient was able to leave the bed. At a subsequent office visit the patient confided that his family physician was called the evening before my first visit to the patient. The patient was told he had an abscess in his ear, and the doctor used an instrument to open it, when the patient at once became dizzy, nauseated, vomited, and was unable to walk.

The labyrinthine irritation was most likely due to disturbance of the foot of the stapes. Fortunately, the middle ear and labyrinth were not infected, there was no discharge, and the patient escaped the dire consequences that may have followed such an infection.

In the second case both hearing and vestibular functions were completely destroyed. Neither seemed to be of the purulent type, and it is probable that sufficient injury to the stapes was produced to cause either hemorrhage or serous exudate in the labyrinthine cavity.

It should be noted that in certain cases of chronic purulent otitis media, the patient complains of recurring attacks of vertigo. Here it will often be found, upon investigation, that such attacks occur just previous to the throwing off of large masses of cholesteatomatous material. These so-called paralabyrinthitis cases should invariably be subjected to the radical mastoid operation, in order to prevent further erosion of the labyrinthine capsule. In fact, in nearly all patients suffering from chronic purulent otitis media who have vertiginous attacks, without signs of involvement either of the auditory or static labyrinth, the radical mastoid operation should be done. This procedure is followed usually by a cessation of the symptoms. In the type known as the circumscribed labyrinthitis, where there are labyrinth symptoms with a normal rotation test, a positive caloric reaction and a positive fistulæ test, the radical mastoid operation should be done, but the intact membranous labyrinth should not be disturbed. In cases where the labyrinthine capsule is found to be more or less necrosed and sloughing, or where sequestra involving any portion of the labyrinth are found, the necrotic areas should be removed, but, so far as possible, the operator should avoid extending the procedure beyond the lines of demarcation; in other words, he should not go beyond the walled-off areas. Here a partial labyrinthine excavation is justifiable.

Finally, a word of caution, in performing the radical mastoid operation, is here ventured. It is a fact that in a considerable proportion of cases of fatal labyrinthitis reported the histories state that the labyrinth symptoms appeared soon after the performance of the radical mastoid operation. It is fair to assume that in many of these cases the labyrinth invasion results from careless operating, wherein the stapes is dislodged from its position in the pelvis of the oval window, the round window is entered, or the bony capsule is punctured by chisel or curette. These accidents are unjustifiable and should not occur.

This paper has been written with the intent of provoking discussion and bringing to light the opinions and experiences of other observers, in the hope that we may more rapidly reach some definite basis regarding the indications for surgical measures.

SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE, SECTION ON OTOTOLOGY.

Meeting of October 13, 1916.

Atypical Sinus Thrombosis.

DR. HUGH BLACKWELL: The patient was first seen on April 15, 1916. At that time he gave a history of having had a discharging ear for two months. For the last two weeks he had suffered from severe headaches—chiefly nocturnal—and some nausea.

Aural examination revealed a marked sagging of the posterior wall, profuse discharge, very acute general mastoid tenderness, and marked mastoid deafness.

The patient was immediately sent to the hospital, and was operated upon the same day. On opening the mastoid it was found to be filled with pus. Smears from the cells showed the presence of streptococci. The sinus plate was found to be diseased and was partially removed, the sinus being exposed for a considerable area in its vertical portion. It was of normal appearance. For the following eleven days the patient's convalescence was uneventful. On the twelfth day of convalescence, without any apparent chill, the patient suddenly developed a temperature of 105.4°. During the following nine days there were seven distinct rises of temperature. Five of these rises reached points between 104.4° and 105.4°, and two reached 103.6°. These accessions of temperature were followed by five intermissions to normal and by two marked remissions. Throughout this period the patient was under the most careful observation, in order to detect any evidence of chills or chilly sensations. No trace of this symptom was present; the patient did not even complain of being cold prior to the rises of temperature. The remissions were not accompanied by sweats.

Immediately after the first rise in temperature a blood culture was taken, which proved to be negative. Blood count showed 11,000 white cells present, of which eighty-nine per cent were polymorphonuclear leucocytes. The mastoid wound

was negative in appearance, as was also the exposed sinus. The middle ear had ceased to discharge.

Eight days after the initial rise of temperature a second blood culture was taken, which showed numerous colonies of streptococci, the blood count showing 13,000 white cells and a lowering of the polymorphonuclear count to seventy-nine per cent. In the meantime some chest râles developed, and slight tenderness at McBurney's point. Dr. Wyckoff, our internist, made several examinations of the chest and abdomen, and finally decided that there was nothing in these cavities that could account for the temperature.

On the ninth day of temperature the patient was operated upon a second time. A well organized clot was found, completely occluding the torcular end of the sinus. The clot was removed and the jugular vein was excised. Subsequently the patient's temperature dropped and he made an uneventful recovery.

The only atypical feature worth noting in this case was the absence of anything remotely resembling a chill or sweat. Dr. Blackwell, of course, was aware that the absence of chills in sinus thrombosis has been noted before, especially in children; but it is rare to see so many rises of temperature as this case presented—seven in all—associated with a septicemia, without any chill. The case illustrates the value of the services of a skilled internist in excluding chest and abdominal complications as a cause for the temperature. The blood culture was purely a confirmatory aid in reaching the diagnosis. The absence of a bacteremia was to be expected in the initial culture, as was the presence of a positive culture after the condition of septicemia became established.

Paper: Septic Sinus Thrombosis of the Jugular Bulb, With Repeated Formation of Thrombi in the Sigmoid and Lateral Sinuses—With Special Reference to the Literature of the Involvement of the Torcular Herophili in Such Cases.*

By JOHN RANDOLPH PAGE, M. D.

DISCUSSION.

DR. JOHN D. RICHARDS said that he had had the pleasure of seeing this patient with Dr. Page, and that aside from the

*See page 595, September, 1916, number.

anatomic features of the torcular, brought out in Dr. Page's paper, there were certain pathologic facts which may in specific instances give an idea of the extent to which a thrombosis is likely to invade a vessel, and as to whether it will or will not pass to or beyond the torcular. The point which he wished to bring out is especially well illustrated in the jugular vein, as we study the conditions in that vessel, in cases of jugular resection for sinus thrombosis.

First, we find frequently in cases of sigmoid sinus thrombosis, when the clot has blocked the vertical portion of the sinus and also the bulb, that the upper portion of the jugular is either occluded by a clot or else is collapsed; the block or the collapse in the jugular, however, extends only to the facial vein, but not below it. The lower portion of the jugular in these cases is well filled, and circulation is taking place between the facial and the jugular. If we are careful to note in this type of case the condition of the vein wall in the collapsed or thrombosed portion above the facial, we will find that in the vast majority of cases the vessel wall shows no visible phlebitis. In such cases the thrombus may be fairly extensive, but the phlebitis remains local; and while the thrombus may extend far beyond the limits of the phlebitic area, yet it stops short at the first great tributary or emissary, and upon the same principle and for the same reasons as does the clotting in veins following the ordinary process of ligation.

Second, in the other class of cases where we find upon opening the neck that the jugular vein is collapsed or thrombosed below the facial as well as above that point, we invariably find that the jugular vein wall is involved in a phlebitis. The same thing applies to the sigmoid sinus. A phlebitis is no respecter of either tributaries or emissaries; a thrombus is. When, therefore, we find a sigmoid sinus which as we progress backward toward the torcular by successive operations becomes more free of the evidence of phlebitis in the outer wall, we may with fair confidence assume that the contained thrombus in the vessel, while it may extend back to the torcular, will limit itself there.

DR. E. B. DENCH said that in a general way he agreed with Dr. Page, and that one should always continue until the sinus

wall appears healthy. A healthy sinus wall, however, cannot always be determined, for although the sinus may look healthy macroscopically, infiltration of the sinus wall with pathogenic bacteria may be present. Dr. Dench said that he had frequently incised the internal jugular where the macroscopic appearance of the vein was normal and where the vein contained no clot, and that a microscopic examination of the wall of the vein showed infiltration with streptococci. In other words, the extension of the infiltration of the wall of the vein is more rapid than the formation of the clot, and it is therefore necessary to go well beyond the clot in order to get well beyond the infiltration of the sinus wall.

Dr. Dench also considered that the anatomic part of Dr. Page's paper was valuable. He did not think that it made so much difference whether the lateral sinus of one side was continuous with the lateral sinus of the other, or whether the lateral sinus of one side was continuous with the opposite superior longitudinal sinus. The important point was that the sinuses entered the torcular irregularly, and consequently pressure applied to the torcular would probably seal the unopened sinuses running into this reservoir. The shutting off of the torcular would take place by the adhesion of the walls of the various sinuses. Such an occlusion would be aseptic in nature. Dr. Dench said that he had lost one case because he had not exposed the sinus far enough toward the torcular.

Dr. J. R. PAGE, in closing, said that he agreed with Dr. Richards about the phlebitis and the progress of those cases; but even where there was involvement of the vein wall, he thought it would rarely extend to the opposite side, for the reason that the main channel did not lead to the opposite side. In a case reported by Liddell, with a right lateral sinus involvement, two-thirds of the sagittal sinus was involved before the phlebitis extended across to the opposite lateral for a short distance. The tendency is for the clot to proceed to the sinus of which it is a continuation. It does not, as a rule, pass beyond the communicating branch. In the case of Simpson, the clot extended into the straight sinus without crossing to the other side. The patients usually die before it extends to the other sinus.

Paper: Report of a Case of Tubercular Mastoiditis—Radical Operation Under Cocain Anesthesia.*

BY HAROLD HAYS, M. D.

DISCUSSION.

DR. THOS. J. HARRIS said that Dr. Hays' report of this case, with suggestions along the line of local anesthesia, was timely, for it illustrated what few of us possibly remember, that the subject has been thoroughly studied by Dr. Day of Pittsburg, who had treated of all the points presented by Dr. Hays.

DR. DENCH said that it was a question whether a patient who received five-eighths of a grain of morphin in five hours was having local anesthesia simply.

DR. HARRIS, responding to Dr. Dench, said that Dr. Day had not used morphin. The French also had studied the subject and had done a great deal of such work under local anesthesia.

DR. GUTTMAN asked how much time was occupied by the operation.

DR. HAYS replied that the time was about an hour.

DR. GUTTMAN said that he had performed a radical operation about a year ago under local anesthesia, using hyoscin and scopolamin instead of morphin, and then infiltration with novocain and adrenalin, and that his experience was similar to that of Dr. Hays. It required two hours to perform the operation. In operating he had had no trouble until the middle ear was reached. The patient had no sensation of pain and did not complain, but the middle ear was very sensitive; so he had not tried the method again. He had also used the so-called Neumann method for anesthetizing the middle ear, and notwithstanding all this, the pain was very acute. Otherwise, the operation was very satisfactory. The field of operation was absolutely bloodless on account of the adrenalin.

DR. DENCH said that he had not understood how strong a solution of adrenalin had been employed.

DR. HAYS said that he used a 1/1000 solution.

DR. DENCH said that he had used a solution of this strength several years ago for the control of hemorrhage, and a good deal of sloughing had resulted.

DR. HASKIN said that he had operated on several cases

*See page 109.

under local anesthesia, and that it was not necessary to employ morphin. One patient upon whom he had operated was suffering from Bright's disease, and morphin was contraindicated. This patient had no pain and made an excellent recovery. Two other cases were operated upon last winter, with no trouble whatever. He always injected the canal of the ear as well as the tissues over the mastoid. When doing a mastoid under local anesthesia, the results depend not so much on the anesthetic employed as upon the method of operation. If a drill or electric burr is employed, the patient is spared much of the fear and dread occasioned by the chisel. One of these patients talked all the time during the operation. Dr. Haskin said that he did not understand why the burr is not more frequently employed; it is the easiest and safest way of taking down the canal wall and removing the outer cortex. One has only to be a little careful with the manipulation, and it leaves a clean beautiful wound, without the necessity for any scraping. In his hands it had proved much more satisfactory than the chisel and curette.

DR. HERZIG stated that he used urea and quinin hydrochlorid four per cent solution, as a local anesthetic in two cases of mastoiditis, where a general anesthetic could not be given, instead of cocain. He injected the solution in and around the region of the primary incision, and also into the upper wall of the auditory canal, just as one does to do an ossiculectomy. He experienced no difficulties in operating, and the patient suffered no pain, even when the antrum was reached. The time elapsing from the time of injection and operation was thirty minutes in each case. No toxic symptoms were present, and no preliminary injections of morphin were given. Both of the cases were diabetic. There was no sloughing aside from that normally expected in such type of cases.

DR. HAYS said that he had no intention of reporting this case as an original method of operating, since he was perfectly aware that it had been done before; but that sometimes it is well to impress the possibilities of a method that is not frequently employed. Nearly everyone has patients suffering from diabetes or nephritis where the method may be advantageously applied. Although he knew that the operation had been done by others, yet he went about it rather fearfully.

It did not make very much difference whether the loss of sensation was produced by the morphin or the cocain, provided the anesthesia was secured. Sometimes it is not desirable to use general anesthesia, and in such cases he would not hesitate to use local anesthesia, as in this instance.

Adenocarcinoma of the Hypophysis Cerebri Complicating a Chronic Purulent Otitis Media.

DR. WESLEY C. BOWERS presented a preliminary report of this unusual case, which will be reported in full later.

DISCUSSION.

DR. DENCH told of performing a similar operation at the New York Eye and Ear Infirmary, doing it in two stages. Twenty-four hours after the exposure of the dura, the patient went into a collapse. He then opened the dura and found the auditory nerve trunk involved and the dura. A microscopic examination of the tumor showed it to be an adenomatous growth of the pituitary body. It was another case of those very rare growths which extend along the entire surface of the base of the skull.

Paper: End Results in the Radical Mastoid Operation.

By THOMAS J. HARRIS, M. D.

DISCUSSION.

DR. DENCH said that if he were to open and close the discussion in three words, he would say "that he disagreed." The operation under consideration has, as the writer of this paper stated, been employed for twenty years, and yet the writer of the paper presents only eighty-five cases—and these not his own—upon which to decide the merits of the procedure. Dr. Dench said that his own operating book showed that over seven hundred cases had been performed in his own clinic and private practice, either by himself or by his assistants. Certainly, if he had been able to show only fifty per cent of cures in these cases, he would be ashamed to stand before the section and discuss the operation. He agreed with Dr. Harris that

there are three factors to be considered: the cure of the supuration, the danger to the life of the patient, and the preservation of the function of the ear. The question of danger to life, he considered to be absolutely nil. In the seven hundred and thirty-four cases operated upon, either by himself or his hospital assistants, not a single death could be directly attributed to the operation. In the paper read on this subject before the International Otological Congress at Bordeaux, he reported about one hundred cases in which the operation had been performed. One of these cases died of meningitis, but this meningitis was probably present before the operation. At that time we did not have the elaborate methods for determining the presence of meningitis which exist at the present day. So far as danger to life is concerned, with a properly conducted anesthesia the operation is as free from danger as is an interval operation for appendicitis.

In regard to the hearing, Dr. Dench said that in nearly every article he had written he had stated that if the patient had poor hearing, with no nerve lesion, the hearing would probably be improved by the operation. If the hearing in the affected ear was only moderately impaired, then the hearing would probably be the same after operation as before operation. If the hearing in the affected ear was very good before operation, it would probably be somewhat impaired by the radical procedure. In other words, if the hearing is very poor, and this impairment is due to a middle ear lesion alone, the hearing will probably be improved by the radical operation.

With reference to Dr. Harris quoting Dr. Dench as saying that in all cases of cure the discharge had not entirely ceased, this statement was absolutely wrong. The cases where slight discharge still persisted after operation were not reported as cured, but improved. The percentage of cures, therefore, mentioned in Dr. Dench's article quoted by Dr. Harris was absolutely correct. Dr. Harris stated that in some of the cases which he had examined there was profuse discharge after several months. Dr. Dench said that in cases where the discharge persisted for months after the operation, he would certainly operate a second time. In private cases, all discharge ordinarily disappeared in from two to four weeks. In hospital cases, the period of convalescence was somewhat longer, owing

to the fact that certain minute details in technic were apt to be overlooked in the dressing of hospital cases—where a large number of cases have to be attended to in a given space of time. In his private work, almost invariably the patient could be sent out of the city at the end of two weeks, or two weeks and a half, with perfect safety; and if the ear was not completely dry, the subsequent after-treatment was so simple that it could be carried on either by the patient or by any general practitioner.

Dr. Harris had said nothing as to whether these cases were allowed to dermatize, or whether a primary or secondary skin grafting had been used in the cases reported. The use of the primary skin graft certainly shortens the period of convalescence, and should be used in all cases with very rare exceptions.

With reference to operating upon cases where both ears were involved, Dr. Dench made the following rule: If both ears were the seat of suppuration, and both demanded operation, Dr. Dench operated upon the poorer ear first. If after the discharge ceased the hearing in the ear operated upon was much improved, and was good enough for the patient to follow his vocation, the opposite ear was then operated upon. In the case of total deafness upon one side, and a suppurating otitis upon the opposite side, Dr. Dench said he would naturally hesitate to operate upon the ear on which the patient depended entirely for his hearing. He would not operate upon such a case unless the symptoms were very severe. In spite of all that has been said regarding the danger to the hearing of the radical operation, Dr. Dench spoke of several cases in which both ears had been operated upon, and in which the hearing was improved by the operation—in fact, one of the cases, after the operation had been performed upon the poorer ear, came back and requested that the other ear be operated upon because the operation upon the first ear had so greatly improved the hearing.

Dr. Dench said that the more of these operations he performed the better he performed them. The operation is a difficult one, and the technic of the operator influences greatly the result. With proper technic, good results can be secured, and the man who has performed the most operations would

probably have the best results. He objected to the fact that anyone should take eighty-five cases of this character at random and put them forward as the end results of an operation which had had a life of twenty years. Now, as to the selection of cases, Dr. Harris had stated that by means of the X-ray plates, and by physical examination of the ear, one can form an accurate opinion as to the extent and nature of the involvement. Dr. Dench absolutely disagreed with this, and cited a case recently operated upon in which the physical examination of the ear would lead one to think that there was very little intratympanic involvement. At the time of operation the dura was found exposed over an area about an inch square. The X-ray pictures in these cases will not show you the location or extent of intratympanic involvement.

Now regarding the eustachian tube, everyone knows that a middle ear discharge confined to the eustachian tube is not dangerous. While, of course, one would prefer to secure a perfectly dry ear as the result of operation, a mucous discharge from the eustachian tube will never lead to any intracranial involvement.

Dr. Dench said he wished to impress upon the men present that the radical operation was not a dangerous procedure, and only to be used in extreme cases, but that it was a procedure which should be used in the majority of cases of chronic supuration. It was impossible to say by looking at an ear just which cases were dangerous. The mere fact that there is a large opening in the drum membrane does not render the case safe. The drainage from the upper part of the tympanum may suddenly be shut off, in spite of a large opening in the drum membrane, and then intracranial complications may follow.

Dr. YANKAUER said that he was very glad, indeed, to have heard Dr. Harris' paper, for it gave him an opportunity to compare statistics from the closure of the eustachian tube through the intact external canal, an operation which he had described some time since.

According to Dr. Harris, barely fifty per cent of cases operated upon radically result in dry ears. Dr. Yankauer said that his own statistics showed fifty-two per cent of cures by closing the tube.

In regard to the results of hearing, decided difference obtains. The experience of all has shown that the hearing is lost in most instances after the radical operation, and Dr. Harris' report confirmed that. In the cases collected by Dr. Yankauer last year, fifty-two per cent were cured, and in forty per cent the hearing was reported improved, making ninety per cent improved hearing after operation. The same is true of cases of tinnitus. Ninety per cent showed improvement in the tinnitus.

The radical operation is an operation which is intended to cure chronic suppuration; but if a simple minor procedure, which can be done in the office or dispensary under local anesthesia, will cure half of the cases so treated, then it has a distinct value and should be further studied.

Another interesting fact presented from the collection of cases is that of the half of the cases reported as not cured about seventy were subsequently operated upon radically, and of these, eighty-eight per cent were reported as cured. Eighty-eight per cent of operations by various persons is a higher percentage of cure than was shown by Dr. Harris; that was probably because the infection was diminished by the previous curettement of the tube. If we have a procedure which can be performed in the dispensary which will cure so large a proportion, and if the cases which are not so cured have a better chance of being cured by the radical operation, then the value of this proceeding is clear, and it should be performed in the office or in the dispensary for all cases that do not require immediate radical intervention.

Only in those cases where this operation fails to cure should the radical operation be done; for if we do not close the eustachian tube, the only thing that is left is to do the radical operation, and you will have to close the tube, anyway; so it seems rational to do this operation first and wait results in all cases where it is allowable to wait before doing the radical.

DR. PAGE said that every case has to be decided by itself. There is such a wide difference in these cases, that in some a great deal of deliberation has to be exercised before the radical operation is decided upon. Even when the radical operation has been decided upon and the patient is on the table, it is better, before the middle ear is entered, to investigate the

antrum and the mastoid cells and attic region from behind, and to exenterate the tympanic cavity only if the disease lead one to it. For his own part, in patients with a considerable degree of hearing, he had occasionally during the operation decided not to do the complete radical, but some modification of the mastoid operation, and had taken the chance on its stopping the discharge with less effect on the hearing, telling the patient afterward that it might be necessary to operate a second time; and in this way he had not infrequently been lucky enough to get a good result without having to do the more radical operation.

In regard to the hearing, he agreed with what Dr. Dench had said about one being able to give, in the main, a fairly definite prognosis in the three classes he referred to. There is, however, sometimes a gradual loss of hearing for no apparent cause, the patient having at first fair hearing with a dry cavity, and then gradually in a few years losing it. No doubt, all present had had such cases. Even with a clean dry cavity the hearing sometimes gradually gets worse. He had there that evening a girl who was operated upon nine years ago, whose cavity had remained dry all the time, and who still hears a moderate whisper at twenty feet. He knew of one case in which total loss of hearing occurred during the night after the radical operation had been performed.

DR. HASKIN said that during the last twenty-three years he had seen a great many cases that had been operated upon by the radical method in the clinical work in the hospitals, and while he agreed very largely with Dr. Harris' observations, it was not exactly fair to claim that these are true end results, for we do not know what was the history of the cases before, or even after operation. Hospital records are seldom complete, and it is very rare that cases are tested before operation.

In 1908, Dr. McKernon brought out the fact that sometimes for a short while after an operation the hearing appears to be better, but said that his end results, after a few months, was very bad—the hearing almost invariably grew worse. That has been the experience of many. He himself avoided the radical operation until he had employed every possible means of averting it, and had not done a radical mastoid operation in his private practice for ten years. He had not had a case that

he had not been able to dry up, and had had no cases with cerebral or cerebellar complications. He believed that if proper precautions were observed, the condition could almost invariably be cleared up; even in clinic cases, he felt that he could cure eighty per cent of the cases without operation. It is a necessary operation in certain cases, but in very few.

DR. LEDERMAN said he could endorse the statements of the reader of the paper. According to his experience, in recent years the tendency to perform radical mastoid surgery had certainly subsided. This he thought was due to the fact that acute suppurative otitis media is receiving better and more prompt recognition and treatment. Consequently, cases of prolonged suppuration with necrotic changes are less frequent. In former years, in the majority of cases operated upon, the hearing was worse after the radical treatment. He also found that we could not accept the radiograph as the essential factor in determining the actual presence of disease in the mastoid or neighboring structures in these chronic cases. He recalled three instances where the plates showed indications of involvement around the mastoid antrum and middle ear area, and the suppuration cleared up without the radical operation. In another case, where persistent headache and some tenderness existed over the region of the antrum, with the presence of a little discharge in the middle ear, of a chronic nature, the radiograph decided him to perform the radical operation. On opening the mastoid antrum, so little involvement of this cavity and aditus was found that the middle ear was not disturbed, and the local suppuration ceased without further annoyance and with good hearing. Two years ago a boy, eight years old, was referred to Dr. Lederman from out of town for an opinion as to the prognosis of a suppurative otitis of a year's duration. The boy had been under the care of competent and conservative aurists, and after some local treatment a radiograph was taken. The plates suggested a cloudiness in the region of the mastoid antrum; and as a mucoid discharge persisted, the radical operation was advised by the attending aurist.

On examination, Dr. Lederman found a marginal perforation in the anterior superior quadrant, with some mucoid secretion in the canal and middle ear. Bacteriologic examina-

tion showed staphylococci. As the patient's tonsils and adenoids had been removed, simple local cleansing by suction and mopping was advised, followed by the application of a specially prepared iodine powder containing ten per cent of iodine, this being promptly liberated as the powder came in contact with the moist mucous membrane. After three such treatments, together with applications of argyrol to the eustachian pharyngeal region, the ear became dry, and has remained so for over a year.

In still another instance where the above treatment was carried out, an equally good result was secured in a young woman patient, who had had a suppuration of both ears for over fifteen years. This patient had been wearing rubber artificial ear drums to improve her hearing, being aware of the existing diseased condition. Both membranes had been absorbed, together with most of the ossicles. Though considerable secretion existed after the artificial drums were discarded, the simple treatment mentioned in the former case, with local application of the iodine powder, brought about a decided improvement, and at present the ears are practically dry, with fair hearing, even with the loss of the normal conducting mechanism.

Further instances of the activity of this new iodine powder will be reported at another time. It has given the same pleasant results under the observation of several colleagues.

Dr. HAYS said he did not think it quite right to let the discussion close without mention of the modified radical operation, such as had been presented by Dr. Blackwell a number of times. Many of those who do not perform this operation so often as Dr. Dench, do not get as good results as we would like. There are many cases in which the ears are nonodorous. He had seen a great deal of Dr. Blackwell's work, and his results were excellent; and in many instances he himself had obtained as good results from the modified radical as could have been expected from the complete radical.

Referring to what Dr. Yankauer had said about the eustachian tube, he had some time ago reported a number of cases in which, after six months, nine had remained dry—some of them after a second curetting of the tube. Six were cured originally; the others were sent to Dr. Yankauer for observa-

tion, and he curetted them again and they are now well. Many of these cases go away from observation after a short length of time, and we cannot say whether or not they have a permanent good result.

DR. BLACKWELL said that something had not been mentioned which must be considered when regarding the statistics reported by Dr. Harris. It is usually true of clinic or hospital cases, where a satisfactory result has been secured, following a radical operation, that the patient is frequently lost sight of and disappears. When he does show up, he insists upon seeing the surgeon who carried him through his former trouble, and regards the advances of all other physicians with a certain amount of suspicion. On the other hand, the cases which are attended by an unsatisfactory result continue to return, and will at times seek to be examined by other physicians, in the hope of obtaining a cure. Only one-third of the total number of cases responded to Dr. Harris' postal of inquiry, and as this small number of cases showed such a high percentage of unfavorable results, it was fair to assume that in the remaining two-thirds not heard from the results were much more favorable.

In regard to the Yankauer operation, as Dr. Dench had said, it is in cases of middle ear discharge of tubal character that one would not recommend a radical operation. Intelligent treatment will dry a large percentage of these ears. Dr. Blackwell said he was convinced that in these cases of tubal discharge, the question at issue was not one of the discharge, but of the hearing. These patients usually hear better when the ear is slightly moist than when it is perfectly dry, and he believed that the ultimate functional result is better when the ear is rendered dry as the result of treatment rather than by obliterating the eustachian tube.

DR. RICHARDS said that as he understood the matter, the question under discussion was the radical operation itself. As Dr. Harris had seen these cases and examined them with sufficient thoroughness to prepare a paper on the subject, it would be interesting to know if in the unhealed cases the area giving trouble and causing the nonhealing was not, in practically all, anterior to a vertical line dropped through the facial ridge. In other words, was not that portion of the cav-

ity corresponding to the body of the mastoid healed in practically all, and the part giving trouble that which corresponded to the tympanum?

DR. HARRIS replied: "Not always, but in a considerable number."

DR. RICHARDS said that the above was nearly always the case as he had seen it, and that nothing could point more clearly to where the fault was. Why is it that practically all operators can and do get healing in the posterior portion of the cavity, but fail in the anterior portion when they do fail? The reason is plainly this: that the part corresponding to the body of the mastoid is easily accessible, and the dead bone in that area is removed by all operators. Consequently, that portion heals. The front part of the cavity, corresponding to the tympanum, is crowded with important structures; it takes time and patience and work to acquire a technic which enables an operator to remove dead bone from this area without inflicting injury; and those gentlemen who can get but fifty per cent of cases healed are those who do not sufficiently perfect their technic, and who under the circumstances use good judgment in not attacking this area. They would exercise better judgment if they did not operate at all. The defect is in the operator. Why blame the operation?

If we were to go to the representative institutions of this city and watch the radical operations as they are performed one after the other, we would have no difficulty in seeing why it is that the results are as Dr. Harris states. The specific errors most commonly committed are these:

First.—Failure to lower the facial ridge to its absolute limit. Unless this is done, it is utterly impossible to clean out the posterior portion of the tympanum and hypotympanum except at grave risk to the facial nerve. In addition, it prevents proper dressing of the case subsequently, and permits the tympanum to fill up with granulation tissue which effectively blankets the inner tympanic wall, the round and oval windows, thereby decreasing the hearing.

Second.—Failure to remove the serrated fringe of bone representing the anterior margin of the facial ridge back to the descending limb of the facial nerve. This removal should be carried down to the level of the hypotympanic floor, other-

wise the hypotympanum in its posterior part is inaccessible and cannot be closed.

Third.—Failure to lower the floor of the bony auditory canal down to the level of the floor of the hypotympanum. Unless these three steps mentioned are taken, it is impossible to get at a mass of cancellated structure posterior to the promontory, which is always diseased in the chronic suppurative cases of the type under consideration, and which if allowed to remain will certainly give trouble. This cancellated structure is peculiarly hard and firm, and shows little tendency to throw itself off by the process of caries.

Fourth.—Failure to shore down the convexity of the anterior bony canal wall so as to increase the anteroposterior axis of the cavity and render (in conjunction with No. 2) the tympanum easily accessible and open. Further, by taking this step we will be enabled—in conjunction with No. 5—to get complete access to the tube area, which otherwise we cannot do. Unless this step is taken in conjunction with No. 2, the tympanum is frequently shut off from the main cavity by a curtain of epithelium which forms during the process of healing, at about the site of the original drum. The tympanum often remains as a suppurating cavity anterior to this epithelial curtain. When this curtain once forms, it is very difficult to eradicate it. If the portion of the cavity anterior to it does by chance clear itself of the suppurative process, the curtain is an advantage, and in such cases we often have excellent hearing. When, however, suppuration continues in the cavity anterior to the curtain, the curtain then is a decided disadvantage. The things which enable it to form are: too small a distance left between the anterior canal wall and the facial ridge, and the leaving of a portion of the annulus tympanicus from which the curtain springs. Little or no packing of the cavity also favors its formation.

Fifth.—Failure to remove the annulus tympanicus completely, and the lip of bone overhanging the mouth of the eustachian tube. When this is done, it is surprising to what a depth we can see into the tube. When this is not done, we cannot curette the tube area, and at the tympanic mouth of the tube there is cancellated bone which is frequently necrotic.

Sixth.—Failure to remove the outer attic wall, particularly

in its anterior part, and to carry the removal upward flush with the floor of the skull.

Considering the lack of attention paid to the tympanum in the radical operation as ordinarily performed, the wonder is that as many cases heal as do. The foregoing six reasons account for the vast majority of failures. When these steps are carried out, the cases heal. Dr. Richards said what he particularly wished to emphasize was that if these points are not carried out, the fault is not with the operation, but with the operator.

The chief criticism he had to make on Dr. Harris' paper was that he did not know whether a thorough radical was performed or whether the radical operation was but partially performed in these cases. According to the thoroughness or lack of thoroughness with which we operate, we can present statistics to uphold our contention.

When we consider the high standard of excellence to which the operation has attained, with its splendid results, the fact most clearly brought out by the paper was that there should be such a lack of diffusion of knowledge of the technic required to success among those who have adopted this work as their profession.

DR. WESLEY C. BOWERS said that a year ago a stenographer had come to him with an ear which had been discharging for twelve years. The external auditory meatus was narrow externally, but otherwise normal throughout. The ossicles were bound down in the superior quadrant, with the cicatricial membrane apparently adherent to the wall of the middle ear, with a large opening over the tube. The discharge seemed to come from the tube, and he thought it could be helped by local treatment. He treated the ear for three or four weeks, with but little improvement, so he told her that a radical operation would be the best thing to do, though it would probably affect her hearing. She disappeared for a while, but came back two weeks ago and wanted the operation. On pushing the periotum forward, it was found that there was an opening in the bone of the posterior canal wall which led into a large cholesteatomatous cavity. This illustrates how impossible it is to tell, at times, just what the condition of the mastoid is in the presence of a chronic discharge from the middle ear. Out of

the twenty-six radical operations which he has performed in the last year, there were not more than five that did not have cholesteatoma. This being the case, how can we hope to get a permanent cure by local treatment of the middle ear? There would seem to be something wrong about the selection of the cases for this operation.

DR. T. J. HARRIS, in closing, thanked the gentlemen who had taken part in the discussion, and said he had brought forward the subject because, as he had stated, he felt that we had been doing the operation long enough to have a frank heart-to-heart discussion of it. He expressed himself as being particularly gratified that Dr. Dench was present, as they had had many discussions in the past. Had Dr. Dench followed his usual practice of reading the paper in advance of the meeting, he would not have made many of the criticisms offered, for he had apparently not grasped them correctly.

So far as the accuracy of the findings was concerned, the number of cases reported was small, but when they were borne out by other cases here and abroad, it formed a sufficient number upon which to base a discussion. In regard to Dr. Dench's statement, Dr. Harris said he had already expressed the opinion that everyone recognized Dr. Dench's great ability in this work, but that this, in his opinion, did not form a criterion for the average results which otologists are getting the country over.

He also wished to state distinctly that his findings did not lead him to condemn the operation; in spite of these findings, the operation is not for a moment to be condemned. What he had attempted to do was to put on record that the findings in this series of cases, in connection with what others had reported to him all over the country, and what he had found in the foreign clinics, made him feel that there is a demand for a much more careful study of cases of chronic suppuration as to whether or not they shall be operated upon radically, than we have been in the habit of giving them. Dr. Page had stated his (Dr. Harris') views accurately.

In speaking of the X-ray findings, Dr. Harris said he meant that this was one of the aids that should be employed; not that we should draw from such findings alone that suppuration meant radical operation; but simply that if we used the X-ray

more in determining what cases to operate upon, in connection with other methods, the results would be better.

Dr. Richards had stated many points which he himself had had in mind. No one should jump to the conclusion that in this discussion we were doing more than taking a sober, clear, and candid consideration of the subject. It was true that the work of such men as Dr. Dench, Dr. Richards, and Dr. Page was the level that all should strive for; but the claim made in the past that every case of suppuration was a case for radical operation, and that we should expect a complete cessation of the discharge, was not in accord with his investigations and what he had observed elsewhere.

NEW YORK ACADEMY OF MEDICINE,
SECTION ON OTOTOLOGY.

Meeting of November 10, 1916.

**Traumatic Rupture of Membrana Tympani Complicating Fracture
of the Temporal Bone.**

DR. JOHN A. ROBINSON: Two months ago, C. M. C., aged forty-five years, received a blow on the right side of the head. He fell to the floor, striking his head on the left side. He was removed to St. Peter's Hospital in New Brunswick, unconscious, with sharp bleeding from the canal of the left ear. He regained consciousness in three days, remained in bed six days, and was permitted to leave the hospital in a week, and returned to work. He found he could not perform his duties as foreman in a munition plant, because of headache, deafness, discharge from his left ear, and general weakness.

I saw the patient for the first time on September 18th, two weeks after the injury. He then complained of deafness, pulsating tinnitus, and discharge from his left ear, and some occipital headache which was not constant; temperature, 99°; pulse, 64, and some fatigue on exertion. The entire left side of the head was tender, there was slight rigidity of the neck, slight vertigo on turning the head quickly to the right, no nystagmus, no vomiting, no ataxia. Both pupils were equally contracted, but reacted to light and accommodation. The fundus was normal. His mental condition was good.

On examination the canal showed a moderate amount of serous discharge, with slight sagging of the posterosuperior wall. The drum membrane was slightly bulging and reddened, with a linear tear extending through the posterosuperior and posteroinferior quadrant, pulsating and with gaping edges. A smear showed a mixed infection.

Acoumeter not heard; moderate voice, one foot; upper tone limit, 20,000; lower tone limit, 126. Rinne, negative. Weber, referred to the right. No ataxia. Turning elicited nystagmus for ten seconds.

The patient was admitted to the New York Eye and Ear

Infirmery, and an X-ray plate, made by Dr. George S. Dixon, showed both mastoids to be of pneumatic type, the right clear, the left hazy to cloudy. There were two lines of fracture, one about three centimeters long, curved somewhat, and directed upward and backward on the left parietal, directly above the mastoid process. The other was about four centimeters long, not connected with the first, but beginning a little behind it, and running downward and forward through the posterior portion of the squama, and ending in or near the mastoid antrum.

The patient was put to bed and wick drainage begun, the gauze being changed four times in the twenty-four hours, after cleansing the canal. It soon became apparent that the discharge was intermittent; at times the gauze would remain dry for some hours, and again would become saturated in half an hour. A small quantity of the discharge was examined, and as it did not respond to the test for glucose, cerebrospinal fluid was ruled out. It reacted, however, as blood serum. The inference was that the left mastoid was more likely filled with blood than pus.

The patient was admitted on September 18th, and remained in the hospital ten days, spending seven days in bed. The discharge gradually ceased, and the ear became dry in ten days. At the dressings the first four days after admission the serous discharge was profuse. The headache gradually ceased. At times there would be slight vertigo on turning quickly to the right. On September 30th, four weeks after the injury, the rupture in the drum head closed. The hearing has steadily improved. He now hears a low whisper at six feet.

DISCUSSION.

DR. PHILLIPS said that all who had had much experience could relate interesting histories of this kind. In one instance that he recalled a man fell from a ladder—he was a carpenter—and struck on his head. He was unconscious for several days, and had a hemorrhage from both ears, having sustained a traumatic rupture of both membranes. After about two weeks consciousness returned, but he was totally deaf in both ears. Dr. Phillips said that this was the only bilateral case he had seen.

DR. DANZIGER inquired whether there was any danger of traumatic epilepsy after such a fracture. He had seen, about a year ago, a case of fracture of the occipital bone extending forward through the external meatus. The patient had a hemorrhage from the ear. The labyrinth was tested and found normal; the hearing was normal; the tuning fork was lateralized to the affected ear; there was no vertigo or nystagmus. The blood clot in the ear was not disturbed.

Within a few days the patient felt normal, but an X-ray picture by Dr. Caldwell disclosed the above described fracture. The surgeon who saw him afterward thought of the possibility of traumatic epilepsy later in life, in spite of the fact that the motor area was not involved by the fracture.

DR. VOISLAWSKY, replying to Dr. Danziger, said that he had had a case in which epilepsy did follow, but it lasted for only eighteen months; and as he had not seen or heard from the patient for three years, he had every reason to believe that the condition had cleared up.

Paper: A Case of Labyrinthine Fistula With Complete Loss of Cochlear Function and Persistence of Normal Vestibular Function.*

BY JULIUS AUERBACH, M. D.

DISCUSSION.

DR. BRAUN said that Dr. Auerbach's case was a most interesting one, but was not so very unusual. That the hearing was completely abolished and the static labyrinth still functioning, was due to the fact that the end organs in the cochlea are less resistant to infection than those in the vestibule and semicircular canals. Alexander had the opportunity of examining, histologically, several cases of acute suppurative labyrinthitis, which died early in the disease. He found the organs of Corti destroyed, and the cristæ and maculæ still intact. Dr. Auerbach's case, in all probability, had had a serous labyrinthitis, seven months ago, which had destroyed the end organs in the cochlea, but had left the vestibular end organs intact.

Dr. Braun had not had an opportunity of examining the patient's middle ear, but it did not seem likely to him that an

*See page 117.

inflammatory process which was so severe as to cause a destruction of a portion of the bony labyrinthine capsule, had entirely healed spontaneously. He thought it would be much safer, in a case of this sort, to do a radical mastoid operation to insure healing. He had operated on nine or ten cases of labyrinthine fistula, and all had healed. He did a radical mastoid, and did not touch the labyrinthine fistula. The fistula cicatrized over, and all symptoms disappeared.

DR. PHILLIPS was inclined to agree with Dr. Braun about the present condition of the case. He had looked into the ear, and the intertympanic cavity well up in the attic region was covered with inspissated pus, and he was sure a large crust could be removed at this moment. The thing that had saved the man from great discomfort was no doubt the breaking down of the outer wall of the attic and the sloughing of the bone, so that fair drainage was maintained. It would almost seem as if the discharge came from around the region of the fistula. If this was an instance of fistula in a chronic case that was better for not being submitted to the radical mastoid operation, it was the first of the kind that Dr. Phillips had seen. He was much inclined to think that even yet there may be some trouble, for he believed that there was still some cholesteatomatous material in there.

DR. BRAUN, in reply to a request from Dr. Harris, as to what the pathologic condition was in the fistula cases, said that in all the cases he had had, where there was a fistula reaction, he had found a fistula in the horizontal semicircular canal. It varied in size, sometimes being no larger than a pin point, and at other times a quarter of an inch in length, and the entire width of the canal. In several cases, in which a fistula was found at operation, and in which there was no fistula reaction, the location of the fistula was in the cochlea, or on the superior or posterior semicircular canal. The fistulae all occurred in chronic suppurative middle ear conditions. The mastoid cells were sclerosed, and the antrum and middle ear contained pus and granulations, and in some instances cholesteatoma.

DR. PHILLIPS said he thought the vast majority of these cases had cholesteatoma.

DR. DANZIGER asked if Dr. Braun had ever seen a partial recovery of either the cochlear or the vestibular function after

an unquestionable attack of serous labyrinthitis. He himself had never seen a recovery from an attack of serous labyrinthitis without complete loss of function. The patient's loss of function of the cochlear apparatus is due to a process of atrophy. When this patient had his attack of vertigo, he probably did not have a labyrinthitis, but some disturbance of the air pressure or circulation acted on the vestibular apparatus more vehemently on account of the fistula, which may be due to some former bone process or even a natural dehiscence. He thought the patient should not be subjected to any operation.

DR. BRAUN, in reply to Dr. Danziger, said he had seen several cases of serous labyrinthitis in which the vestibular function was retained during the course of the disease.

An Extensive Cholesteatomatous Mass Simulating a Sequestrum in the X-Ray Plate.

DR. J. J. KING: Case 1.—H. C., a normally developed youth of eighteen years, was admitted to Dr. Lewis' service in the New York Ear and Ear Infirmary, on July 15, 1916, with the following history:

He had had the ordinary diseases of childhood. Eight years ago, after scarlet fever, he had an abscess in the left ear, and it has been discharging at intervals ever since. At times there would be swelling and pain over the mastoid tip. The hearing was defective.

Examination revealed an occlusion of the exterior bony canal to such an extent that nothing larger than a fine applicator could be passed. There was swelling, redness, and a fistulous tract just over the tip of the mastoid. A very foul and purulent, but scanty, discharge came from the canal and this fistulous tract. Upon probing through the fistula, bone could be felt. The patient could hear a watch and acoumeter in this ear only upon contact.

The X-ray plate showed a large shadow in the mastoid, and Dr. Dixon thought this shadow indicated a sequestrum—in fact, this was the chief point of interest in the case.

On July 28th the radical operation was performed in the usual way, under general anesthesia. Upon retracting the flaps a cortical perforation was found, and almost all of the mastoid cavity was found to be filled with cholesteatoma. This

mass had destroyed nearly all the cells, and when it was removed the wound had the appearance seen after a simple mastoid had been performed. The wound was closed with metal clips, and the patient made an uneventful recovery.

Otitis Media Purulenta Acuta, Mastoid Abscess With Perisinus Abscess, Which Was Shown in Radiograph.

DR. J. J. KING: Case 2.—A. F., female, was admitted to Dr. Robert Lewis' service at the New York Eye and Ear Infirmary on September 26, 1916, with the following history:

One month previous to admission to the hospital she had a severe nose bleed. She then blew her nose and a sudden noise was noticed in the ear, followed by a severe pain. She had had no trouble with the ear prior to that time. A week later the left ear began to discharge, and the discharge has been continuous and profuse ever since. Two weeks ago the pain and swelling became severe over the mastoid; no vertigo; occasional nausea.

Examination upon admission to the hospital revealed a profuse discharge from the middle ear, with a red and edematous drum membrane. There was some swelling and edema over the mastoid, with exquisite tenderness over the region of the mastoid emissary vein.

The temperature on admission was 102.6° F.; pulse, 134.

X-ray findings by Dr. Dixon: "The right is small, typical, pneumatic. The left is also pneumatic, with elongated tip. A large and very peculiar mastoid emissary vein; it is very cloudy."

After studying the plate, Dr. Dixon advised immediate operation. A large shadow just below the mastoid emissary vein was shown in the plate, and this proved at operation to be a perisinus abscess.

On September 28, 1916, the usual postauricular incision was made and a simple mastoidectomy performed. The cortex was not perforated and was normal in appearance. Much free pus was found in the antrum, and granulations were present in the cells. The entire mastoid tip was necrotic and was removed en masse. A large perisinus abscess was found just below the mastoid emissary vein, and in removing this abscess a large area of sinus was exposed. Below the

tip of the mastoid a very large abscess was found in the muscles of the neck, from which a large quantity of pus came. The dura was exposed in three small areas, from which hemorrhage of a dark color was free. The wound was packed with iodoform gauze and partly closed with metal clips.

After this operation the patient was more comfortable and the wound progressed normally, but there was still some pain on pressure posterior to the wound. The temperature ranged from 99° to 102° F., going up every afternoon. It was a regular septic temperature.

On October 10, 1916, after consultation with Dr. Blackwell, the wound was again opened, and an incision was made extending backward and downward for one and one-half inches behind the edge of the wound. A large abscess was found and much pus was evacuated. A counter puncture was made below, in the most dependent part of the abscess, and through and through drainage was established by means of a cigarette drain.

After this operation the temperature rapidly subsided to normal. The healing of the wound was satisfactory, and the patient's recovery was uneventful in every way. She was discharged from the hospital, cured, on November 4, 1916.

DISCUSSION.

DR. GUTTMAN inquired whether the case was a typical Bezold mastoid, to which Dr. King replied in the negative.

DR. HURD told of two cases of extensive cholesteatoma in which the labyrinth was invaded.

DR. HELLER said that Dr. King's first case reminded him of a young girl of fourteen or so who had had scarlet fever when two years old, and was operated upon for acute mastoiditis. Thereafter she had had no medical attention whatsoever; nothing but the usual household remedies. When the discharge got bad enough to offend her or the family, she syringed it. The ossicles were gone, and the patient had a foul discharge; but she applied for the treatment of a lump behind the ear, the size of a hen's egg, with a bulging of the scar. As the condition was absolutely painless, it was evidently not an inflammatory condition. No cholesteatoma was visible in the tympanum or meatus, and the condition suggested a sebaceous cyst

in an unusual location. She consented to an operation, and at first he thought he had found a sebaceous cyst; but on opening the capsule he found a large mass of sebaceous-like material, which proved to be a cholesteatoma. The cortex underneath this was hard, and a hole not much larger than the lead in a pencil was disclosed, communicating with old mastoid cavity. This was enlarged, and another cholesteatoma was found as large as the first. It made a sort of hourglass shaped mass. The inside was completely reamed out, as Dr. Hurd had described. All that remained to be done was to take down the posterior wall, and the mastoid operation was complete. Recovery was uneventful.

DR. BLACKWELL, referring to Dr. King's case of cholesteatoma, said that it had been his experience that these cases usually recover after operation, despite their extensive involvement. This was probably due to the formation of a limiting capsule of rarefied bone about the cholesteatomatous and abscess cavity, no doubt caused by the extreme chronicity of the infection, this delimiting wall protecting more or less the important intracranial tissues.

In the case of perisinus abscess, he wished to refer to the apparent diagnosis from the X-ray plates made by Dr. Dixon. Dr. Dixon's skill and technic in making and reading these plates has certainly reached an unusual degree of accuracy.

DR. SCRUTON said that he was not familiar with the history of Dr. King's second case, but that such a case is sometimes the forerunner of an atypical sinus thrombosis. Dr. King said that the temperature was approximately normal, but on the premise that it is still running a temperature, if he were managing it he would feel that it might develop into a septic sinus thrombosis. One can have a case of that kind with a temperature of 100° or 100.5° for weeks. The patient would not be sick, but would have a little headache or a little tenderness of glands in the neck. The only thing that would absolutely point to the condition, in addition to having had a possible injury of the sinus, would be a leucocytosis of 18,000 and a high polymorphonuclear count. He suggested that if a leucocytosis examination had not been made, it should be done.

DR. DURKEE told of a case that showed how these cases of abscess in the tissues of the neck may at times be rather puz-

zling. The patient, a man of fifty years, gave a history of pain behind the ear which had continued for about two months, when there was a discharge from the ear and a large swelling over the upper part of the mastoid. This swelling disappeared in a few days, and at the same time a swelling appeared in the upper part of the neck. When the man first came into his hands there was a large fluctuating swelling in the upper part of the neck and over the lower part of the tip of the mastoid. There was no swelling over the upper part of the mastoid, and no tenderness over the antrum or emissary vein. The canal showed a large amount of pus, and there was sagging of its upper wall. The abscess in the upper part of the neck was opened and a sinus was found extending from its upper part and underneath the periosteum to a necrotic spot about the size of a ten-cent piece in the bone over the antrum. The usual mastoid operation was done. The bone was gone over the sinus and the dura above, and both sinus and dura were covered with granulations. Some very deep cells were found below the antrum between the sinus and the posterior canal wall. These were uncovered, but not curetted, for fear of injuring the facial nerve. At the first dressing the entire wound was in good condition except the deep cells that were found below the antrum. From these there came a large amount of pus. In irrigating these cells the solution came into the patient's throat. In two or three days deep fluctuation was found low down in the neck below the sternomastoid, and a deep abscess was opened. The opening in the pharynx closed in a few days, and the mastoid wound was healing well, but the patient developed erysipelas and died.

This case shows how a case of superficial abscess in the neck, without a good history of the ear condition and a thorough examination of the ear, might lead to an error in diagnosis.

DR. VOISLAWSKY asked if Dr. Durkee had found how the fluid got into the throat, to which Dr. Durkee replied in the negative.

DR. GUTTMAN said that all have cases where, after a mastoid operation, the temperature keeps up, and after looking for the cause and not thinking of sinus thrombosis, redness is found below the tip of the mastoid, and an abscess developing which sometimes breaks through into the sinus and causes a pharyn-

geal abscess. This seemed to be the case in this instance. It was not probable that in the case described the pus should have attacked the sinus by breaking through the hard ivory-like bone covering the sinus, when it was easier for the pus to burrow into the sheath of the muscle. Therefore, he did not think it was a case of sinus thrombosis.

DR. VOISLAWSKY said that Dr. Scruton's suggestion was worthy of consideration.

DR. KING expressed his appreciation of the full discussion of his cases. The temperature in the second case never suggested a sinus thrombosis temperature. With the exception of once, it never went above 102°, and then it was 103°. The patient ran that temperature right along. She never had any steep temperature; after the second operation, it went right down and remained down. The wound has completely healed now, and the patient reports occasionally for observation. Dr. Scruton's suggestion of a sinus thrombosis, however, was well taken, and we should always be on the lookout for thrombosis in atypical cases.

Relation of Air Pressure in the Ear to Ear Diseases.

DR. JOHN W. DURKEE endeavored to prove whether true or not the statement often found in the literature of otology, that back of a nasal obstruction, in the posterior part of the nose and nasopharynx, and in the eustachian tube and middle ear, there is, during inspiration and during the act of swallowing, a negative pressure that is greater than that in the normal nose, and that this increased negative pressure is a common cause of ear disease, especially chronic catarrhal otitis media.

An effort was made to determine the air pressure in the normal nose. Ten patients with normal noses were chosen and, using a water manometer connected by rubber tubing with a straight eustachian catheter, records were made from the middle of the inferior meatus and nasopharynx.

To determine the air pressure back of a nasal obstruction, ten patients, in whom there was a deviation of the nasal septum which practically closed one side of the nose, were chosen, and records made behind the deviation and at a corresponding place on the clear side of the nose.

Seven of the patients with normal noses were then chosen, and one side of the nose closed with cotton while the other side remained clear. Records were made behind this obstruction and at a corresponding place on the unobstructed side.

An average of these measurements gave the following figures:

Normal nose, at the middle of the inferior meatus, plus 2.5 millimeters of water and minus 3.4.

Cases of deviation of the nasal septum: behind the deviation, plus 3.4 and minus 4.5; on the unobstructed side, plus 4.2 and minus 5.2.

The cases in which one side was closed with cotton: obstructed side, plus 3.5 and minus 5.0; on the clear side, plus 4.3 and minus 6.4.

A combination of the deviated septum cases and the cases in which one side was closed with cotton: obstructed side, plus 3.4 and minus 4.7; on the clear side, plus 4.2 and minus 5.8. During swallowing the pressure in the nasopharynx was zero.

The conclusion reached was that the negative air pressure found in the nose and nasopharynx in cases of nasal obstruction can hardly be considered a cause of ear disease.

DISCUSSION.

DR. HARRIS said that to him a paper like this, which had nothing to do with surgery, was delightfully refreshing. It makes one remember that there are many problems in otology beside surgical ones. Dr. Durkee was to be congratulated on the very careful work he had put into this paper; it was the sort that all like to hear. There are two kinds of original work. Very few men are capable of evolving something entirely new. He had heard some men say that when they thought they had discovered a new idea they found it had been patented long ago. There is a large field for such work as Dr. Durkee had done—in the proving or disproving of certain assertions that had been previously made.

Dr. Durkee's method of procedure was decidedly ingenious and interesting; and those who had not had opportunity to do this kind of work would find it difficult to take exception to

his conclusions. It would require personal work of a similar kind to discuss the paper, but the conclusions which Dr. Durkee had reached were in line with what Dr. Harris himself had always felt.

The recurring question of the effect, or the possible effect, of negative pressure on the middle ear has not been settled, and may not ever be; but certainly the old proposition that we have in the ear a membrane with atmospheric pressure on the outside and inside, and if we have a tube which is obstructed, the drum will be driven in, while it obtains sometimes, does not always obtain. All clinical experiences show exceptions to this. We see drum membranes that are not retracted although the tube is obstructed; and we see every day tubes that are apparently normal, and yet the drums are retracted. Dr. Durkee's conclusion that the tube is of such a character that we cannot arrive at a fixed and firm conclusion seemed just and fair. In the question of negative pressure there are many factors entering into the problem, and the relation of nasal disease to diseases of the middle ear is still far from settled. The very broad and strong statement which we have heard, and still hear, that all that is necessary to cure middle ear disease is to remove obstructions from the nose, has been shown to be wrong. There are many other factors entering into middle ear disease.

Dr. Harris said that he personally was inclined to believe that often bacteria are the cause, and that in many instances we have to look outside of the nose for the cause of disease existing in the middle ear. It would be interesting if Dr. Durkee's experiments, which were necessarily limited in number, could be repeated.

Dr. HUBBY also congratulated Dr. Durkee on his painstaking work. It was certainly very important to take up such questions as these. He agreed with Dr. Durkee that in a one-sided nasal obstruction the negative pressure in the nasopharynx, during swallowing and inspiration, is not sufficient to produce any change in the middle ear directly. On the other hand, if both sides are obstructed, Dr. Durkee found that the negative pressure on swallowing increased less than a millimeter. Although this loss of a millimeter sounds very small, yet it is sufficient to produce a sense of fullness in the

ear when you try it, if you have a normal eustachian tube, and it is also sufficient to be demonstrated, as has been done with the manometer by Politzer and others. Of course, as Dr. Durkee said, chronic bilateral obstruction is not a condition that is common or allowed to continue. One must remember also the fact that during swallowing the eustachian tube opens, so that the pressure of less than a millimeter is readily communicated to the middle ear.

Taking up the secondary effect of changes in pressure in the nasopharynx, positive and negative, it is quite a common experience in chronic turgescent rhinitis to find that the turgescence shifts from day to day, attacking first one side and then the other; and it is believed that this is due to changes of air pressure on one side when the other side is obstructed—a to-and-fro compression and suction exerted on the nasal mucosa; and if this is maintained for any great period of time, chronic hyperplastic rhinitis results with involvement of the eustachian tube and tympanum as sequelæ.

DR. GLOGAU said that he was very much interested in Dr. Durkee's experiments, for he himself had been doing some similar work at the Speech Research Laboratory of Vanderbilt Clinic for the past two years. Dr. Durkee's method is very interesting. It is similar to the one that had been used by Gutzmann in Berlin and by Froeschels in Vienna. Smoked paper records for measuring the air pressure within the nose and nasopharynx have been in vogue for a long time, although usually Marey's tambour has been used. Dr. Glogau found that when a small hole has been cut into the rubber tube near the nasal olive the nasal air pressure is reduced to such a degree as to render the oscillations of the lever comparatively small. In this way any obstruction to normal breathing can be easily recorded. Dr. Glogau, in different papers, had advocated that the rhinologist should make smoked paper records of nasal breathing before and after nasal operations, whereby both the doctor and the patient could be objectively convinced of a return to the normal of formerly abnormal breathing.

Dr. Durkee said that he made his experiments on people that were breathing normally. In order to find out whether or not a person breathes normally, breathing curves of the thorax and of the abdomen must be recorded first. For we

have certain invariable rules for normal breathing, both during rest and during speech. During rest, the length of the wave for inspiration and expiration in both thorax and abdomen is almost the same, the expiration being only slightly longer. The breathing curve of the nose is somewhat irregular, but shows also the same length of the rising and of the falling part of the curve. The moment we start to speak, the nasal curve becomes a straight line, elevations being only noticeable at the pronunciation of the letters m, n, and ng. The thoracic and abdominal breathing curves during speech differ also considerably from those during rest. The inspiration becomes very short, the expiration markedly prolonged. The quick inhalation goes through the mouth, and we speak on a prolonged exhalation.

In persons suffering from speech defects, the breathing curves are also abnormal. In pronounced stuttering, for instance, even the curves of mere breathing show irregular elevations and sudden jerks. During speech the thoracic and abdominal breathing curve of the stutterer become pathognomonic. We find an irregular conglomeration of inspiratory and expiratory jerks, interrupted by straight lines, indicating the stoppage of breath. The nasal curve of the stutterer during speech shows characteristic fluctuations, due to the extension of the irregular concussions of breath to the soft palate, and from there to the air space within the nose.

It is quite frequently overlooked that a normally functioning soft palate is essential for the aeration of the middle ear. Within the soft palate are contained the opening and closing muscles of the eustachian tube. Insufficiencies of the soft palate can be easily recorded on smoked paper. By including such experiments as Dr. Durkee reported, and also the broader field of experimental phonetics, the specialty of otolaryngology will broaden its scope.

DR. HAYS said he had hoped that Dr. Durkee would give some new facts which would be helpful in explaining why a certain atmospheric pressure is necessary in order to have a normal ventilation of the eustachian tube. When we examine a nasopharynx in these cases, we often find a number of pathologic conditions. In most of the cases of catarrhal deafness the trouble lies in a diseased condition of the eustachian tube

which is usually secondary to some pathologic condition in the nose and throat. Whether the pathologic condition in the nose is directly accountable for the impaired hearing, depends upon the individual case. But the fact remains that in almost every case of catarrhal deafness we find a stenosed or an atrophic eustachian tube. It has been stated tonight that in every normal act of swallowing we manage to get a certain amount of air into the middle ear, which is sufficient to counteract the pressure outside the drum, so that we have an equal pressure on both sides. Whenever this atmospheric pressure is interfered with, we get a change in the normal ossicular transmission of sound. The best evidence that air pressure is necessary is shown by the change in hearing when the Valsalva method of inflation is used. Here an exaggerated air force enters the middle ear, which distends the drum, and increases the hearing for the time being. Incidentally, Dr. Hays said, such a method of inflation is inadvisable, for sooner or later the drum becomes relaxed and sound waves do not reach the cochlea.

Regardless of what others might say, Dr. Hays said that he had seen many cases of deafness associated with pathologic conditions in the nose and throat. We are wont to be careless in our examination of the nose and throat in ear clinics, but in private practice, where examinations are more thorough, it is surprising how often we find abnormalities which not only need correction, but which prove by the increased hearing that such correction has been the basic fact in the trouble. His explanation is that proper tubal ventilation is established. Some years ago he investigated a number of cases of deafness, paying particular attention to nose and throat abnormalities, and in a number of these cases nose and throat operations were performed and an improvement in the hearing was noted.

Dr. Hays concluded that physiologic experiment and pathologic conditions could not be compared, and that each case had to be looked at from its individual standpoint.

DR. SCRUTON said that Dr. Durkee had showed that air pressure in the pharynx has very little to do with the ear conditions. That is borne out clinically by the fact that most of the nasal obstruction cases, deviated septum, etc., do not complain of ear conditions; this statement refers specifically to

adult cases. Examination day after day in the ear clinic of cases of otitis media purulenta chronica indicates that perhaps one-half have apparent nasal obstruction, and a majority of these are compensated.

DR. DURKEE, being asked to close the discussion, said that he had nothing to add.

NEW YORK ACADEMY OF MEDICINE,
SECTION ON OTOTOLOGY.

Meeting of December 8, 1916.

Case of Serous Labyrinthitis Complicating Acute Otitis Media.

DR. ERNST M. DANZIGER: The patient, Mrs. M., was taken sick with grippe during the month of April, 1916, and in the beginning of May developed an acute attack of otitis media. She suffered for a week before calling in Dr. Danziger. She then had a temperature of 101° and a typical picture of acute otitis. On the second of May, in the morning, a paracentesis was done, followed by an immense amount of serum oozing through the cut. The patient felt almost immediate relief until in the evening, ten hours later, when she felt sick at her stomach. When seen at that time she had a typical nystagmus toward the affected side, but could hear with the noise apparatus in the other ear. The caloric test was not made, for the patient was too sick. A diagnosis of serous labyrinthitis was made, and the patient was put to bed in a dark room, and so placed that when she looked up the nystagmus would not occur. The next day the symptoms were the same, but the nystagmus had changed from the affected to the healthy side. She still heard with the noise apparatus on the other side. In another day she got totally deaf, and continued in that condition for a week, and then got better. On November 1st she was put in a turning chair and turned, first to one side and then to the other, showing a shortened after-nystagmus. The affected ear did not respond to any caloric test, and there was no nystagmus present; the patient could walk without dizziness, and showed no disturbance of the vestibular apparatus. She was totally deaf, however, with the Bárány apparatus to the good ear. The reading test showed the typical rising voice with the noise apparatus. Lateralization of tuning fork to the good ear.

Dr. Danziger said that this was the fifth case of the kind that he had seen in his experience, and the picture and the

result were so typical, he thought that the complete loss of function was a part of the picture of diffuse serous labyrinthitis. He had not seen a single case recover with hearing on the affected side, and he did not think one should expect recovery. He had looked up the literature, and had asked various men if they had seen such recovery, and they had all replied in the negative.

DISCUSSION.

DR. BRAUN said that he had a similar case last June. A man of about thirty years had a double acute otitis for two weeks. He had had a paracentesis twice in both ears. When seen by Dr. Braun the left ear had healed. The right drum membrane had closed up, was red and bulging, and there was a slight amount of tenderness over the mastoid. Another paracentesis was done on the right drum membrane at about five o'clock in the afternoon. At two o'clock the following morning he had dizziness and vomited. When seen at ten o'clock in the morning he had been suffering from dizziness for eight hours, and had a typical picture of an acute labyrinthitis, with complete destruction of function. He had nystagmus toward the sound side, and was completely deaf in the affected ear. No caloric test was done because he was too sick. His temperature was normal. Dr. Braun said he did not then know whether it was serous or a suppurative labyrinthitis, and does not yet know. The severe symptoms went on for a week and then subsided; and in ten days the nystagmus had disappeared. Today the patient is well, excepting for a dead labyrinth on that side and a slight amount of vertigo on sudden movement. One could not say in either this case or Dr. Danziger's case what the pathologic lesion was, but only that it was an acute labyrinthitis. These cases do not come to autopsy, so they cannot be examined pathologically. Complete loss of function may occur in both forms of labyrinthitis.

DR. DANZIGER corroborated what Dr. Braun had said. If a case comes to autopsy, one knows what was going on, but these cases which are regarded as serous labyrinthitis do not recover with any function.

In reply to a question from Dr. Eagleton, Dr. Danziger said: "At a very early stage of an otitis the probable diagnosis of a serous labyrinthitis can be made. An acute laby-

rinthitis following later, when changes in the bone have taken place, gives the strong suspicion that we have to deal with a purulent labyrinthitis."

Tubercular Mastoiditis With Sequelæ—Multiple Operations.

DR. WILLIAM LEDLIE CULBERT said that he had been asked to present this patient, a full report of whose case had been made at the annual meeting of the American Laryngological, Rhinological and Otological Society at White Sulphur Springs last May. This report was published in *The Laryngoscope* of December, 1916. The members could see for themselves what a healthy looking, unusually robust child the patient now is. He then gave the history of the case briefly, as follows:

On March 22, 1914, the child, then seven and a half months old, was brought to him with a history of having had a discharge from the right ear for six weeks, accompanied with more or less severe pain. During this time she had developed a beginning facial paralysis. She was very much emaciated, had a temperature of 101° ; pulse, 144; respiration, 24. Chest and abdomen negative. The left ear was normal; right, otitis media purulenta acuta, with complete sagging of the external canal wall. There was a purulent discharge, but inadequate drainage. The tissues around the external ear were infiltrated, producing an extensive diffuse furuncle. There was a purulent discharge from the nose.

The same day a simple mastoid operation was done. The whole mastoid was found to be involved; it was thoroughly cleaned out and the furuncle was incised. Later, the stitches of the mastoid wound all pulled out and the wound did not granulate, but assumed an unhealthy grayish appearance. The von Pirquet test gave a strongly positive reaction, and washings from the mastoid wound demonstrated the presence of tubercle bacilli.

On April 8th tuberculin injections of one minim of a 1 to 1,000,000 dilution were begun, and these were gradually increased in strength at five-day intervals for a year, until ten minims of a 1/10,000 dilution were given. During a part of this time there was a large amount of pus coming from the parotid gland, and from the other wounds the whole time.

On May 20th the child was again sent to the hospital for

the incision and drainage of the furuncle. After that the right cervical glands became involved and developed into a large fluctuating mass. On July 16th she was sent to the hospital for the third time, and this mass of purulent glands was dissected out.

In March, 1915, the staphylococcus hemolyticus was demonstrated from the middle ear, and an autogenous vaccine was prepared and administered through April and May. This had a marked effect on the copious purulent secretion from the various wounds, reducing the discharge to practically nothing, and also reducing the purulent nasal secretion. During these months the child gained steadily in strength and health—indeed, became quite robust.

In July, 1915, the child came back again with a temperature of 105.2°; pulse, 137; respiration, 44. There was also a discharge from the middle ear, which had come on suddenly. She was immediately taken into the hospital and a radical mastoid operation was performed. A sequestrum was found, involving the whole of the mastoid process with the posterior canal wall. This sequestrum was removed en masse, and the subsequent pathologic report showed it to be typical tuberculosis of the bone. From that time (a year and a half ago) the child made an uneventful recovery, and has remained well ever since. During the healing process another washing was made from the wound and examined for tubercle bacilli, but none was found. The ear has been perfectly dry for a year and a half.

DISCUSSION.

DR. QUINLAN asked whether the incision was deep and extensive, involving the facial nerve which was buried in the substance of the parotid gland.

DR. CULBERT replied in the negative.

DR. QUINLAN asked if a Wassermann test was made, and upon Dr. Culbert's replying in the affirmative, he said that the presence of the tubercle bacilli would almost eliminate that, but he had frequently seen in these conditions a mixed infection, viz., tuberculosis and syphilis.

DR. DWYER said he thought this was the first case on record in which the tubercle bacillus was isolated from the ear and obtained in a pure culture on media, according to the method

described in a paper last year. In this case they had the demonstration of the organism in the smear, the growth in pure culture, the von Pirquet reaction, and the finding of tubercular disease in the sequestrum. According to his statistics, many of the cases of mastoiditis and otitis media are tubercular in such children.

Dr. Dwyer, replying to Dr. Quinlan's query about the Wassermann test, said that that test was made as a routine procedure in all these cases, and that it was negative.

Dr. DANZIGER asked if the occurrence of the facial paralysis during the acute otitis would not have been one indication for a more radical operation in the beginning.

Dr. BRAUN, replying to Dr. Danziger's question, said that a facial paralysis occurring during an acute middle ear suppuration is not an indication for operation. He had seen a dozen such cases which all recovered without operation. The cause of facial paralysis during an acute otitis is in most instances an anatomic abnormality, a dehiscence in the bony wall of the facial canal in its intratympanic portion. When facial paralysis occurs in chronic middle ear conditions, it is due usually to bone necrosis, and is an indication for operation.

The point that had impressed him in Dr. Culbert's case was that tuberculosis in the ear seems to act differently in children from what it does in adults. In children it is very virulent, and is usually attended with extensive complications, and many cases have been fatal, whereas in adults, tuberculosis of the middle ear usually runs a fairly benign course. It is very obstinate to treatment in adults, but rarely causes any serious complications.

Dr. GUTTMAN asked whether the findings of the washing were pathognomonic for tubercle bacilli; for all of these complications ceased as soon as the sequestrum was removed.

Dr. DWYER said he thought this case was the first one on record in which the diagnosis had been made by the isolation of the tubercle bacillus from the ear in culture. The diagnosis was complete from start to finish—tubercle bacilli in the smear from the ear washings; tubercle bacilli isolated in pure culture; von Pirquet reaction positive (quite reliable in a child of this age); and the final proof, microscopically in the tissue.

Replying to Dr. Guttman's inquiry, he said that this was

probably a localized tuberculosis of the ear, as the examination was otherwise negative, and localized tuberculosis is common enough for us to justify such a diagnosis.

DR. CULBERT, closing the discussion, said he had nothing to add, excepting to respond to the question in regard to doing a radical operation during an acute condition. No one would think of performing such an operation on a child only seven months old, no matter how aggravated the condition. One would feel that he would at least give the child a chance with the simple operation. Again, following the first operation, the facial paralysis did subside—he had neglected to state that—some five weeks after the first operation, with the bad furuncular condition which was being treated. The parotid then became involved, and there was a large parotid abscess. It was then that the facial paralysis was again noted, and in cleaning out a small opening was made, and the necrotic tissue very carefully curetted out. The wound was packed with gauze wet with a one per cent formalin solution, and it healed kindly after that procedure. The facial paralysis was at its worst when the child had the parotid abscess. Since then it had gradually become less and less, and the child can now partly close the eye. The mother says that when the child sleeps and is relaxed the eye comes together. How much of the power of the nerve will be regained is a matter for the future to decide.

Paper: Case of Salivary Fistula Following Simple Mastoidectomy With Cervical Abscess.*

By F. C. SCHREIBER, M. D.

(By Invitation.)

DISCUSSION.

DR. KING congratulated Dr. Schreiber upon the excellent work he had done in working up this case, and thanked him for reporting it before the section. Dr. Schreiber has covered the ground so thoroughly in his presentation that little else can be added in discussion.

DR. SCHREIBER, in closing, said that fistulae affecting the par-

*See page 113.

otid gland are very infrequent, particularly those involving the parenchyma incurred by faulty technic during a mastoidectomy. Incision of abscesses of the parotid are seldom followed by a fistulous tract. There is little doubt that the gland is often injured by sharp retractors, but nature seems provident and closes over the injury.

Dr. Schreiber, in reply to an inquiry from Dr. Eagleton as to whether he was going to try to close this fistula, answered in the affirmative. Dr. V. Hammond of Boston had reported a similar case in 1915, but he had made no chemical analysis of the secretion.

Paper: Results in Four Cases of a Modified Radical Operation for Chronic Purulent Otitis Media.*

BY HUGH B. BLACKWELL, M. D.

DISCUSSION.

DR. BRAUN asked to what Dr. Blackwell ascribed the improvement in hearing in the first case. He had understood Dr. Blackwell to say that this patient was completely deaf before the operation. Complete deafness is never due to middle ear disease. No matter how much destruction there is in the middle ear, there must be some hearing unless there is involvement of the cochlea or cochlear nerve.

DR. BLACKWELL, replying to Dr. Braun, said that the marked deafness existing previous to operation in the first case, associated with a normal vestibular reaction, and the return of hearing to the affected ear after the operation, was to him the most interesting feature in all the four cases presented. He said that he had never seen such a marked loss of hearing in an otitis media purulenta chronica with subsequent restoration of function, and that he could offer no pathologic theory to account for the clinical facts in the case.

DR. WELLS P. EAGLETON reported a case of

Metastatic Carcinoma of the Temporal Bone.

DISCUSSION.

DR. LEWALD said that he had made two X-ray examinations of two cases of metastatic carcinoma of the skull, one showing

*See page 121.

multiple carcinomatous deposits in the skull, following the removal of the breast for carcinoma, three years previously. Professor Wood also saw this case, and thought there must have been an involvement of an artery supplying the skull, with the result that groups of cancer cells were thrown into the branches of the artery, causing the deposit of a great number of cells in the bone. The other case was one of a single metastatic carcinoma of the vault of the skull in a case of carcinoma of the thyroid gland. The Roentgen findings were interesting, in that there was a radiating appearance of dense areas extending beyond the skull line into the soft parts of the scalp. In this respect the growth resembled that usually seen in sarcoma of bone, but microscopic examination proved the tumor to be of the same type of carcinoma as that in the thyroid.

DR. CULBERT said that it would be interesting to know if the carcinoma had extended beyond the temporal bone. Another point he would like to know about was the ultimate result. Dr. Eagleton had not entered into details; he had merely said that the wound healed kindly, but did not state what was the outcome.

DR. DANZIGER said that two and a half years ago he had seen a case of carcinoma of the mastoid, though he did not make that diagnosis early, for it developed very insidiously. The patient had had an otitis two weeks before she was confined, but had paid no attention to it. After the confinement she sent for a physician, who had invited him to look at the case. There was no swelling, no temperature; on looking into the external ear one could see only a narrowing of the canal, which looked almost like a furuncle, and there was a little gland under the tip of the mastoid. The patient, however, complained of excruciating pain in the ear, and had much pain over the mastoid. On opening the mastoid the whole bone was found to be filled with thick tough granulations; the facial ridge was eaten away. It was a rather unusual picture. Some pieces were excised and sent to a colleague for examination, who reported the condition to be carcinoma. Before operation it was not possible to make a clinical diagnosis of carcinoma; it was not metastatic. The patient died.

Paper: Report of a Case of Gumma in Fossa of Rosenmüller, Causing Stenosis of the Eustachian Tube and Deafness.*

By ISAAC M. HELLER, M. D.

DISCUSSION.

DR. GLOGAU asked Dr. Heller whether or not he found a predisposition, due to pathologic change within the nose and pharynx, such as described by Gerber and Gradenigo.

Paper: X-Ray Diagnosis of Perisinus and Epidural Abscess in Mastoiditis—Lantern Slides.

By GEORGE S. DIXON, M. D.

DISCUSSION.

DR. LAW said that Dr. Dixon had covered the subject so fully there was nothing left to say. The plates show the condition absolutely as it exists, and demonstrate the value of X-ray in mastoid conditions. There are certain types in which the condition in the mastoid is worse than the symptoms indicate, and a properly made plate will help to clear up the diagnosis. Dr. Dixon had hardly emphasized sufficiently, however, the necessity for the roentgenologist to know the symptoms, the clinical history, and the pathologic findings. The X-ray is a very valuable help, but only a help, and the roentgenologist should be as familiar with the conditions as the physician. The best way is for him to have the history of the case when the picture is made, and then for him and the physician to study the plates together. There are many otologists who are capable of interpreting their own plates, and more who are not so proficient. There are conditions which cast somewhat similar shadows which are difficult to interpret and which require clinical and pathologic data to clear up. The otologist knows the data and the roentgenologist knows the significance of certain shadows, so a consultation between the two will aid materially in arriving at a definite conclusion.

The value of the X-ray had been demonstrated to a great extent in postoperative cases that do not clear up but continue for week after week. In many instances a roentgenograph will show cells in the mastoid which have not been cleared out.

*See page 70.

DR. LEWALD complimented Dr. Dixon on his beautiful demonstration, and agreed with him thoroughly on the value placed upon the X-ray findings. If they agree with the clinical findings they clinch the diagnosis. In certain cases the Roentgen findings alone may be so distinct as to indicate that operation should be performed.

DR. GUTTMAN said that he would be glad if Dr. Dixon would give a little more of his technic in taking the pictures, and tell how he places the patient, etc.

DR. HELLER said that he also had read Gerber's article, but that in this case the nose was absolutely normal.

NEW YORK OTOLOGICAL SOCIETY.

Meeting of May, 1916.

Sinus Thrombosis.

DR. A. B. DUEL said he wanted to report briefly a case of sigmoid sinus and jugular thrombosis, presenting some unusual features, which he had recently operated. The case at first presented the usual early symptoms. At the end of the second week, when he saw it for the first time, all of the classical symptoms—repeated chills, widely vacillating temperatures, bacteremia, etc.—were found.

On operating, he found a clot extending from the torcula to a point below the clavicle in the jugular. The jugular was tied through the clot, about an inch below the level of the clavicle. It was most difficult to dissect the vein out, owing to the chain of enlarged cervical glands, along its course. He was certain that the cord-like structure he tied off was the jugular only after he had found the facial vein containing blood, and followed it to the jugular by careful dissection.

It was most unusual in his experience to find a clot extending so far down the jugular—probably because one seldom operated now in the second week, the diagnosis being made much earlier than formerly.

The patient, after a very stormy period following the operation, was apparently recovering, after resorting to repeated blood transfusions.

DISCUSSION.

DR. RAE said he would like to ask Dr. Duel what the blood culture had been after the operation.

DR. BERENS said he would like to ask Dr. Duel how far down the neck he had to go in order to find the clot, and if the vein was collapsed above the clavicle.

DR. DUEL said the vein was occluded by a clot well below the clavicle, and he was unable to tie below it. It was filled an inch below the lowest point he was able to tie off the lower end. As he pulled up the severed end the clot bulged from the interior of the vein.

Before he had cut it off, in order to be perfectly sure he had not gotten the nerve, he followed the facial vein down to the occluded jugular, which looked like a whip-cord and was about the size of the pneumogastric nerve. A streptococcus organism was found in the occluding clot, the vein wall and the glands.

Mastoiditis—Cholesteatoma.

DR. W. C. BRAISLIN said he wished to speak of a case, which to him was rather unusual, that he had seen during the last winter. He had never previously seen a case just like it. The patient had had a discharge for many years, since childhood, in both ears, and lately pain over the mastoids with a good deal of headache in both the temporal and occipital regions. The unusual feature of the case was that both meatuses and both canals were tightly packed with apparently a true cholesteatoma throughout. It had been partly removed by her private physician, who sent her to Dr. Braislin. It took him a good many sittings, eight or perhaps ten long sessions, to remove these masses. There also seemed to be some cholesteatoma inside the middle ear. All he could see he removed from a large perforation in either side. During the treatment he had anticipations of operating on the mastoid several times, for the patient continued to complain of severe head pains, and had not been able to sleep nights, except one or two hours together.

After clearing the thing up it rather promptly ceased discharging. When healed it was evident that pressure had existed for some time from these cholesteatomatous masses, from the present great amount of atrophy. The canal was very large after removal of the masses, and seemed to extend well up into the attic, although there was no connection between the canal and the attic.

DR. BERENS said he would like to ask Dr. Braislin how long this discharge had persisted before the sister came to him.

DR. BRAISLIN said that this woman had had the discharge for several years, and the trouble since childhood. He had not anticipated reporting the case or he would have looked it up.

DR. TOEPLITZ said he would like to ask Dr. Braislin if this mass had filled the entire canal.

DR. BRAISLIN said the entire wall was filled up in an organ-

ized mass, which seemed to be in every respect a true cholesteatoma. The hearing was normal after the operation.

DR. QUINLAN said this case recalled to him, not in a microscopic way, but macroscopically, a case which he had operated on six years previously, of a growth from the external auditory canal, which had been present forty-nine years. Occasionally the mass would bleed, and the patient had been told by two or three men that the mass was possibly malignant and it had better be let alone.

The speaker said from the ordinary external examination he could not find the source of its attachment. There was a broken down area outside of its fibrous capsule. He made a postauricular incision and turned the auricle forward and found, close to the lower border of the drum and canal wall, a myxomatous mass with a broad pedicle. He had seen the patient recently, and after six years there had been no return. The growth was examined, and the speaker received a rather indefinite reply, stating that it was a sort of fibromatous mass. He did not know how fibrous tissue would cause such an appearance as this macroscopically.

Tuberculosis Following Mastoid Operation.

DR. CHARLES E. PERKINS said he had been impressed with the number of patients that came to the hospital or dispensary presenting no symptoms of tuberculosis, and after the operation had been performed and during the healing of the mastoid wound, they developed pulmonary symptoms and the examination showed pulmonary tuberculosis. Nothing had occurred previous to the operation to lead one to suspect that the lungs were involved, and yet during the healing of the wound they developed or were found to have tuberculosis. In the past four or five years the speaker had seen something like twenty cases with this history, and he had been wondering whether or not they were primary cases of tuberculosis in the mastoid process, or whether they had operated on pulmonary tuberculosis cases where the mastoid infection had been secondary. The speaker thought that it was often a hard matter to decide. He said he would like to hear the opinion of some of the fellows on this type of case.

DISCUSSION.

DR. TOEPLITZ said he had a case in mind which had been occupying him for a year, and related to that question, and he would like to report the case, since it had always been interesting him as to whether the tuberculosis was in the mastoid or not. During the past thirty-one years he had seen a great deal of tuberculosis, and did not remember any cases of mastoid similar to this. It occurred in a child two years old, less two months, with a large mastoid abscess on the left side. There was also a swelling of the neck. He opened that mastoid abscess and evacuated an enormous amount of pus, which had quite an odor. The swelling on the neck was also opened, and he found an abscess which was not connected with the mastoid, but the entire structures were undermined as far down as the clavicle, and the pus with the odor, which he evacuated, amounted to nearly two cups full. The child was then treated for about six months, and the speaker battled with the case and finally succeeded in closing the wound of the neck, but the wound of the mastoid did not close. The child was then treated for the mastoid wound, being seen every other day at his office. The patient was extremely anemic, and Dr. Toeplitz had suspicions of tuberculosis. The parents of the child were also examined, but they did not show any tuberculosis. Finally, the child had a habit of playing in the mud, using mud as a plaything in preference to anything else, so that it came about that the dressing was frequently removed, and one day the speaker found an amount of maggots in that mastoid wound. He cleaned the mastoid out and despaired of closing it and turned the case over to a colleague for hospital treatment, who thought he would build the child up first, give it treatment and then try to close the mastoid wound. A few days previous to the meeting he had been told that the mastoid wound had not closed as yet, and was in all probability a case of tuberculosis of the mastoid.

That was one case, Dr. Toeplitz said, which came as near to the diagnosis of tuberculous mastoid as any he had ever seen, and it was now one year and two months since the operation and the opening was still there. He thought it an unusual case, and had so far been always able to close the mastoid, except

in cases which he wanted to keep open himself, as in cholesteatoma, he had always closed the wound in these cases. This was the first case like it the speaker said he had seen in thirty-one years.

DR. RAE said that there could be no doubt of the existence of a primary focus of tuberculosis in the middle ear, and that this was essentially true in the case of children. He briefly outlined a case of a baby about three years old, admitted in a stuporous condition to the Manhattan Eye, Ear and Throat Hospital during the winter. The child was an exceedingly well nourished baby. On examination the diagnosis of mastoid with tubercular meningitis was made. In spite of the meningitis it was decided to open the mastoid. Before doing so the laboratory was asked to provide the caustic soda solution so that pus directly from the antrum might be examined for tubercle bacillus. On removing the cortex a distinct pool of pus was exposed, and a specimen from this was withdrawn by a pipette and transferred to the soda solution. On examination this was found to be loaded with tubercle bacilli. An attempt was made to demonstrate the tract of infection to the meninges by removing the whole of the antral roof, but no such path of infection could be shown. The operation did not influence the course of the case, and the child died of tubercular meningitis.

DR. McCULLAGH said he would like to ask if in this case of Dr. Rae's there had been any healing of the operative wound. It seemed possible that some of these cases might have been latent or unrecognized tuberculosis in which the ether caused a rapid development.

DR. QUINLAN said he would like to know if there had been any lymph nodes or broken down glands in the cases just reported by Dr. Perkins.

DR. PERKINS said the cases he spoke of were in adult patients, not the type Dr. Rae had been speaking of. Several of them he remembered in detail, who had no lymph nodes, but the patients looked pale and bad. After the operation he had had the lungs examined, and they were tuberculous. As a rule, they were very slow in healing, many remaining open when the patients passed from observation. Most of the wounds did better after the patients received the fresh outer air treatment, for it had not seemed right to keep them in the environment

they were in, and they were, therefore, allowed to go to the country before the wounds were healed.

DR. QUINLAN asked whether these cases, of which Dr. Perkins spoke, were a tubercular infection of the mastoid—that is, having its characteristic features.

DR. PERKINS, in answer to Dr. Quinlan, said that he was not advancing any such theory of tuberculosis. As Dr. Rae said, it had been demonstrated that there could be a primary tuberculosis in the mastoid and middle ear. In children such tuberculosis was more common than was generally supposed.

DR. RAE said his patient had no lymph nodes whatever.

DR. HASKIN said he would like to ask Dr. Rae if the cases he referred to were chronic cases. He asked Dr. Perkins if tuberculosis had at all been suspected from the appearance of the secretions in the canal, in the first place, in these patients.

DR. PERKINS said that no examination of the aural pus for tubercular bacilli had been made previous to operation, as tuberculosis had not been suspected.

DR. HASKIN said they had found tuberculosis constantly at the Manhattan L. O. Ear and Throat Hospital, probably twenty to twenty-five cases, within the last year. A boy patient had a profuse discharge and a great many tubercle bacilli were in the secretion. He had another patient, a school teacher, which Dr. Rae had also seen, in which the diagnosis was doubtful. There was a tubal catarrh, and they did not know what the thing was. He told Dr. Rae at first that it looked like a tubercular membrane, but the woman had no other evidence. On inflation the tube was perfectly dry, and yet there was a thickened membrane with a peculiar yellowish condition in two places. The speaker finally advised that a paracentesis be done, which they did, and since that she had a profuse secretion from the canal. The condition was absolutely painless. He said the Friday previous they took some secretion from the canal, and after putting this through a sodium solution and centrifuging it, they found tuberculosis. This woman had a tubercular inflammation of the drum membrane, and yet no evidence of a tubercular condition.

DR. HASKIN said that Dr. Lewis has reported three cases of tubercle bacilli at the last meeting, and Dr. Berens two or three cases with sequestra in the canal, and the condition was found

all the time in the hospital. In the probable appearance of a lung condition after operation, there was the fact that the cases may have had it all the time, but they had enough vital resistance in the tissues to withstand actual breaking down. Then the shock of operation and loss of blood causes a tremendous lowering of the vitality, and the secondary infections were able to overcome the resistance of the body and the evidence of tubercular lungs was likely to appear.

DR. DUEL said he thought it quite probable that all of the gentlemen present had in past years operated on a number of cases of tuberculous middle ear and mastoid, being unaware at the time that they were dealing with tuberculous condition. He felt quite sure of this in his own case.

By the present methods of diagnosis a great many cases of tubercular middle ear or mastoid were discovered which tended to alter their view of former results. There were a great many cases of tubercular mastoid or middle ear that would eventually die of tubercular meningitis, but also a number of cases which recovered promptly after operation, without any such grave complications. When one thought of what the pathologists had said, that ninety or ninety-five per cent of the people coming to autopsy had suffered from tuberculosis some time in life, one might form a different prognosis in those cases in which they found tubercle bacilli present in the pus from a middle ear or mastoid abscess.

The speaker said he had operated on a case in an adult, which a number of men had seen on account of the pain, bearing out Dr. Perkins' idea, that not all tubercular processes were painless. The man had two badly broken down mastoids. They thought by draining them they might simply relieve his pain. The patient now has no discharge from either ear. Both mastoids were apparently entirely healed.

DR. BRAISLIN said he would like to ask the chairman if he would give them some of his ideas in regard to the treatment of the tubercular condition. He remembered two cases, apparently typical cases of tubercular conditions of the middle ear in adults, which began to suppurate without pain and had a rapidly melting down drum and other evidences of tubercular ear, one of which had been cured by X-ray with a very good result. He had another case of middle ear suppuration, which

was cured by his removal for the winter to California. The meatus was large, and he was advised to allow the sun's rays to fall directly into the ear.

DR. QUINLAN said he thought that in children especially, the treatment with tuberculin had proven very satisfactory. He did not know just what the results were turning out in grown people, but he thought that tuberculin was a very valuable remedy, and also thought that in the past they had all started to use tuberculin too vigorously. They had paralyzed patients with too large doses of tuberculin, who were overwhelmed with bacilli. Dr. J. Solis-Cohen of Philadelphia had pointed out, two or three years previously, that in his work he was getting wonderful results by the use of tuberculin, and he used about 1/1,000 part of the dose which had been used. He reduced this down to 1/10,000, and gave five minims of that. After he had used up a certain quantity, he gave 1/5,000, and finally a dose of 1/1,000.

The speaker had one case in a clinic patient, a poor child, who had never been out of the city, which would not heal under any other form of treatment, but finally recovered under tuberculin. As far as local treatment went, he thought that one was about as good as another. The speaker thought, with Dr. Perkins, that the majority of patients, if they could be sent away to the country, with plenty of good air and sunlight, that it would be better than anything else that could be done for them.

DR. LUTZ said he knew of a case of a child, which had been treated with tuberculin, which was very much improved and practically cured. Another child, which had apparently a tubercular mastoid, was treated with tuberculin, beginning with very small doses. If he rightly recalled it, Dr. J. Solis-Cohen's article first appeared in the *Therapeutic News*. It had been of interest because of the small doses noted, such as 1/10,000 and 1/20,000, and the gradual way in which they were worked up from these infinitesimal doses, also interested the speaker. He had one little patient at the present time, who had a recurrence of her tubercular condition in the ear. There were some glands appearing, posterior to her mastoid, and Dr. Lutz had told her family physician to start her on tuberculin.

DR. BERENS said that at the Manhattan Eye, Ear and Throat

Hospital for the last year or two, instead of running these tremendous doses, equivalent to 50,000, he now came down to 100 and gradually ran it up. That winter he had had three cases of gland disease, two having been operated upon and one not. All three had done remarkably well. Two of them were well, so far as appearances were concerned, and the other promised to be well within two or three months, judging from the appearance of the glands.

DR. BRAISLIN said he would like to ask the gentlemen present about the method used in obtaining tubercle bacilli in the discharges.

DR. HASKIN said in regard to secretions, that at the Manhattan Eye, Ear and Throat Hospital they washed the canal with a sodium hydroxid solution, three per cent, which had a property of dissolving practically all other bacteria or cocci, except the acid fast staining bacteria. After that it was kept two or three hours in solution and then centrifuged and put on a smear and stained with the regular carbol fuchsin stain. In getting living cultures they syringed with the sodium solution, as before, and after thirty minutes centrifuged it and spread the deposit on tubes with Petroff's media. This media was discovered by Dr. Petroff, now at Saranac, and his original media had consisted in agar agar and beef juice; the speaker did not remember what else it contained, but thought a gentian violet stain. A gentian violet had been used, with the idea that this would kill off all the other bacteria in the growth and eventually the tubercle bacilli would appear in pure cultures, but the sodium hydroxid solution obviated the necessity of this. It was very pretty to see the growth occur in these tubes. Possibly in ten days to two weeks the pure colonies of tubercle bacilli appeared. They afterward did not use the gentian violet at all, and the cultures grew just the same. The preparation of Petroff's media had been given in various journals. It was very easy to make smears and have the cultures take place. Dr. Dwyer, who did the bacteriologic work at the Manhattan Eye, Ear and Throat Hospital, would give all the information about it.

Dr. Haskin said that if they washed out the ears with normal saline solution, this often failed; but with the sodium hydroxid solution they very frequently found the tubercle

bacilli. Almost characteristic of all these cases was the profuse creamy discharge. There would be no pain in the old mastoid, and yet the profuse discharge kept on coming out of the ear. The speaker said one has to be very careful to differentiate the tubercle from the *sirregma bacillus*, which is also acid fast.

Unhealed Mastoid.

DR. F. J. QUINLAN said that three months previously they had admitted at St. Vincent's Hospital a case of fractured skull, in a truck driver who had been tossed from his wagon, and after remaining in the surgical division for two weeks had developed middle ear infection through the site of laceration of the canal. After a week or ten days the process went on to mastoiditis, and he had the characteristic symptoms which demanded operation. At the operation the speaker found the entire mastoid more or less broken down and filled with a creamy pus, and the sinus was exposed and looked rather suspicious, but on account of the bleeding that was associated with it, he thought it wise to let it go. About a week or ten days the house surgeon was disturbed one night with the news that this man had a profuse hemorrhage. When he came down he found the dressings filled with blood and the man almost exsanguinated. The condition was staunched and Dr. Quinlan saw the patient the next day. The day previously the temperature had been $105\frac{1}{2}^{\circ}$. He explored the cavity and examined the sinus. At the time of operation he uncovered as much of the bone covering the sinus as was necessary. At the exploration the next day he found the sinus looking badly, and was assured by the appearance that there was a parietal clot. He removed as much of the sinus as he could, in spite of the hemorrhage that preceded it, and was able to staunch both ends by wicks of gauze, low down near the jugular and as high up as he could towards the torcular. The man went along fairly well, and the speaker said it seemed as if he had mastered the situation, but they noticed the wound was bathed in a profuse discharge. It was now six or seven weeks since operation, and there was absolutely no evidence of healing. The flaps looked like beefsteak that had been cooked, with no evidence of any attempt at healing. A Wassermann test had been made

also, and several attempts to ascertain if it were a tubercular condition.

Even at the present time there was the same low grade inflammation. The man seemed fairly well nourished, but the wound would not heal and looked like a sluggish, inert, dead mass. The speaker had used balsam Peru, iodoform, everything therapy could suggest, and still there was the same condition. He had tried approximating the wound, local applications and general tonics, and the thing seemed almost like a labor without result. He said he would be glad to hear suggestions in regard to this wound—that is, stimulating it to better activity. He never saw a wound secrete more pus and show fewer granulations with less evidence of healing than this one.

Dr. Quinlan said this man was not more anemic than one would find in a man who had had more or less shock from a fracture of the skull and impoverished condition due to loss of blood. The man, he thought, had been alcoholic, but there was nothing upon that score to attract any attention. There was now no evidence of temperature, and the man ate fairly well and digested his food.

DISCUSSION.

Dr. HASKIN said he would like to ask Dr. Quinlan the nature of this infection.

Dr. QUINLAN said the nature of the infection was a pure streptococcus.

Dr. HASKIN suggested the use of gentian violet, one to five thousand. It was used on the other side, where they found it most useful in dressing sloughing and gangrenous wounds, a one to ten thousand solution being even better than a hypochlorate of soda. He had noticed this in a journal of the military association. It had been used many times, and might be of value in stimulating this wound.

Dr. DUEL asked if the ear was still functioning on that side.

Dr. QUINLAN said the ear was still functioning somewhat on that side. He had tested the patient two weeks previously, and he could hear a voice about six feet on that side.

Dr. TOEPLITZ said he would like to ask if there were any hidden abscesses possible in this case.

Dr. QUINLAN said the wound was so large that it had no

recess, no fistulæ. He dressed that case daily and found no sinus, only this large, yellowish white area. He thought at first there was probably some sinus back towards the occiput, but there was absolutely nothing, and every part of the canal was free to inspection.

DR. BERENS said he would like to ask Dr. Quinlan if he had tried any vaccines in this case.

DR. QUINLAN said he had not tried vaccine, as his results with vaccine had not been satisfactory, and he thought he would not use it in this man, although everything had been done with local applications and constitutional remedies. In a day or so they might try something else. He was not altogether favorably drawn to the use of vaccine; still he said he would be glad to give the patient the benefit of any mode of therapy that would aid him toward convalescence.

DR. PERKINS said he would like to ask if the germs in the pus were still streptococcic.

DR. QUINLAN said that up to a few days previously the germs were still streptococcic.

Tonsillar and Mastoid Abscess.

DR. S. H. LUTZ said that on the Saturday previous he had seen a baby one and one-half years of age, which had interested him very much. There was a history of a running ear for a week or ten days, and a history also of sore throat for two or three days. It was stated that there had been something the matter with the baby six months before. The patient had a protruding ear and a prolapsed posterior superior canal wall. There were a large number of glands below and behind the mastoid. The speaker suggested operation. He looked at the baby's throat, and the tonsil on the same side as the ear protruded downward and inward, without any signs of tenderness or acute condition of the tonsil at all, but the location of the tonsil led him to put a knife into the anterior pillar and he got a large quantity of pus. With artery forceps, introduced to dilate the incision, he hit the anterior inferior surface of the mastoid. There was no question that this mastoid was perforated at the anterior inferior surface and the pus collected in the supratonsillar space. He had seen the same thing in a girl, which had been reported at one of the meetings of the

society. Dr. Lutz said he had also had the same experience in a man about fifty years of age, who came to see him with an acute ear, and the speaker then lost track of the patient. When he again appeared he came with a history of bad sore throat, and there was a sinus in the upper part of the tonsillar space, which went directly into the mastoid bone. At operation later the speaker found the whole anterior surface and the tip broken down. The girl died, the man got well, and he did not know what would become of the baby, as he had not seen the baby again.

DISCUSSION.

DR. DUEL said this little girl, of whom Dr. Berens had spoken, had a suppurating sphenoidal sinus. However, the speaker said he remembered a case in an old man, where after a perforation of the mastoid tip the discharge had found its way into the peritonsillar space and there formed a large abscess.

Mastoid Abscess; Probable Meningitis Minus Temperature.

DR. S. H. LUTZ said that a week previously he had had a case of mastoid in a little girl, eight years of age. There was a history of illness before the operation. Both ears were involved, the left ear being worse. The speaker operated on that ear only, as the family were very much opposed to having the two ears done, and he operated on the left one with the hope that after the patient had been in the hospital a few days the family would be willing to have the other ear done. After the operation the child's temperature dropped, and at no time since had been above ninety-nine degrees, but for the past twenty-four hours there had been a great deal of headache and the child complained decidedly of the other ear. Examination of the eye grounds showed no signs of intracranial pressure. The child was carefully watched and the house surgeon reported that there was some stiffness of the neck and other signs of meningitis. There was no temperature, and on spinal puncture a perfectly clear, sterile fluid was obtained. The right mastoid was opened, and a peculiar condition was found. The cells along the zygoma and horizontally backward from the antrum and perpendicularly downward along the anterior border of the mastoid to and including the tip, were very much

involved, but a clear space in the middle of the mastoid was not involved at all. The next day the child was more drowsy, but there were no eye symptoms, no headache, no temperature, and no localizing symptoms of a brain abscess. The case was presented for help, as it was unique in the speaker's experience.

DISCUSSION.

DR. BERENS said he recalled one case of meningitis particularly, in the hospital, where the temperature was almost entirely absent, in which there had been a thick, creamy cerebrospinal fluid. The patient had gone into coma and had died. The speaker said he reported this case two or three years previously.

DR. PERKINS said he would like to ask Dr. Berens what cell count there had been in the spinal fluid in his case.

DR. BERENS said, in answer to Dr. Perkins, that he thought the pneumococcus had been found in the spinal fluid, in the case to which he had referred without temperature.

DR. HASKIN said that regarding the first case which Dr. Lutz had mentioned, he had a little child at the hospital with a most unusual condition, one which he had never seen before. The patient was a boy, about ten years of age, and at the entrance of the external meatus and floor of the canal there was a hole about the size of the lead of a pencil. The speaker gradually dug out some cholesteatomatous masses and washed out the ear, and the day previously he put in a very fine probe and went down an inch and a half into this cavity. In probing towards the ear he could not detect any bone with the probe against the mastoid, which was a very peculiar thing. The boy several years ago had a glandular involvement with an extensive scar on the neck. The speaker said he had never seen a fistula like this, and wondered if it was an old Bezold perforation which had broken down and left a fistulous tract through the canal.

Mastoiditis Due to Teeth.

DR. W. H. HASKIN said that a man had been sent in to him from Freehold, New Jersey, four weeks previously, with a very violent inflammation of the middle ear and tenderness over the mastoid, and the speaker did a paracentesis. The pa-

tient ran a temperature with a streptococcus hemolyticus involvement, but in going over the man's mouth he found a contrivance on the teeth, which he presented to the society. He pulled out a tooth and it was attached to this bridge, and when the second molar came out he found it opened into the antrum. The speaker washed out the antrum through that canal and the stench therefrom nearly overcame the patient and himself. The speaker said this was a beautiful specimen of bridge work which the man had had in his mouth, and that after the removal the mastoid involvement rapidly cleared.

He showed another piece of dental work which had been taken out of a doctor's mouth. The bicuspid had been taken out under local anesthesia, and necrosis had produced a perforation in the alveolar process through which one could put a little finger. He said he would like to have some of the gentlemen look at the bridge work contrivances.

Another case he mentioned was one of the most serious he had ever seen, which had been referred to him about two weeks previously, suffering from some profound toxic anemia. He could not say that it was pernicious, because they had not been able to find any nucleated red cells. The woman first had hemoglobin, twenty per cent, 1,300,000 red cells, the white cell count was 4,200, the lymphocytes 8.0 per cent, and the polynuclears four per cent. A general medical man had examined her, also a surgeon, and they had found nothing to cause the trouble. Dr. Haskin was asked to go up to White Plains to see this patient. He examined the patient's mouth and took some fixtures from the teeth which had been fastened on the roots of twelve different teeth in her mouth, and every one of them had an abscess at its roots, which was shown by radiographic pictures. The woman had been suffering for years with a slow, gradual toxemia, with increasing lymphocytes and anemia coming on, without knowing it. She had no pain, and never suffered with pain, and was surprised when the speaker told her that her trouble was in the mouth. At first sight the right side of the jaw looked like a huge sarcoma, but on extracting the bridgework and pins, he found it was all broken down and the whole thing had since sloughed out. The roof of the mouth was typical of gangrene, but the alveolar process had not yet opened into the floor of the antra and

nose, and he hoped it would not. There was slight evidence that this was going to form a line of demarcation, but he had had to cut out great masses of this necrotic tissue. It had been nothing else than a pure case of poisoning.

The speaker said that six weeks or two months previously he had been called to the Polyclinic Hospital to see a case in a child, who had been lying in the hospital for five weeks, white as a sheet, with the same condition. The hemoglobin count was fifteen per cent and the red cells about 1,100,000. The case had been examined by the general men and surgeons, who wondered what could be the matter, but no diagnosis was made. The pathologist asked him if the condition could come from the mouth. The speaker found necrosis of the right upper jaw from two badly diseased teeth. The whole upper jaw was sloughing out, and in the lower jaw there were two abscess cavities with profuse secretion and osteomyelitis. The child died two days later of nothing but a septic condition in the mouth, from neglected teeth, which nobody had looked at. The speaker said these cases were getting so common that he thought they ought to be constantly on the lookout and not trust the patients to the dentist. It might seem strange to hear, but he stated that not one dentist in ten thousand would recognize these conditions or would extract teeth in these septic cases. It had been recognized by a few men, who had been doing splendid work, and they had come to the conclusion that the dental profession has got to be jacked up. They could not blame the dentists, for their whole method of instruction consisted of gold crowns, fixtures, etc. The speaker said it was not safe to have any fixtures or such crowns, which were absolutely unsanitary and bound to create sepsis sooner or later.

DISCUSSION.

DR. LUTZ said he would like to ask why some dentists objected to pulling a tooth which was evidently covering an abscess. He stated that many dentists would balk at pulling a tooth that the surgeon would at once recognize had to be removed. Surgeons took teeth out and the people got well right away, and he wondered why the dentists were afraid to do it.

DR. HASKIN, in reply to Dr. Lutz, said that it was pure ignorance. The majority of dentists had no conception of

the pathologic condition arising from these things. He said the only thing that could be done was, where one had a clean-cut abscess cavity and there was still a large area of sound alveolar process, that one could go in there through the alveolar process and amputate the roots at the apices and fill the canals, and the tooth would remain in a fairly useful condition for several years, but it was nevertheless a dead body which would gradually work its way out.

DR. QUINLAN said he would like to ask Dr. Haskin what they teach in the dental colleges, and why they did not teach such things as were mentioned by him, especially as the health and comfort of people depends so much upon the condition of their teeth. It is a source of pleasure to note that Columbia University has introduced a department of dentistry, and that the tocsin has been sounded throughout the country that attention to children's teeth is a great asset to their future well-being.

DR. HASKIN said, answering Dr. Quinlan's question, that these colleges were nothing but proprietary schools. The students paid a fee, and were taught to put on crowns and fixtures, and as far as scientific instruction went along the lines of pathology and bacteriology, they were absolutely unfit. They were crammed for the state regents and that was all.

DR. QUINLAN said he supposed they passed an examination in anatomy, physiology, materia medica, chemistry, etc., and that some great missionary should get up and teach them the errors of their past methods, and, if necessary, legislate against measures that sooner or later would bring about misery and incurable diseases.

DR. HASKIN said Columbia College had finally decided to have a branch of dentistry, but with six million people around here, and all the other big universities, like Bellevue, Cornell, etc., there was not one dental school that was alive to the existing conditions.

DR. QUINLAN said he thought there was a school of dentistry attached to Fordham University.

DR. HASKIN said he had heard of the universities of Harvard, Pennsylvania and California having dental schools, where the men had taken the first two years in medicine, which was little enough. The majority of dental schools were pretty bad.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY.

Meeting of November 21, 1916.

THE PRESIDENT, DR. OTIS H. MACLAY, IN THE CHAIR.

Facial Deformity Resulting From Injections of Liquid Vaseline.

DR. GEORGE E. SHAMBAUGH showed the patient, together with photographs which the patient had taken immediately before and after the injections. The work was done several years ago by a "beauty specialist" in California. The victim thought his face too thin, and to overcome this, something over forty injections were made in the course of a day. Aside from a temporary congestion immediately following the work, the man was very much pleased with the results at first. It was not until a couple of years later that the relaxation and sagging took place which gives to the patient's expression the present ludicrous appearance. The sagging of the cheeks over the lower jaw on both sides is the most unnatural feature of the deformity.

The patient, who is a waiter, had expected to improve his station in life by making a specialty of just this kind of work, but the calamity which overtook the efforts on his own face fortunately kept him away from such work. He states that there is a great deal of this sort of work being done on the Pacific Coast, but that there is a good deal of it done here in Chicago. His case presents a fair example of what quackery does in medicine. The question is whether anything can be done now to relieve the condition.

DISCUSSION.

DR. NORVAL H. PIERCE thought that if hard paraffin had been used there might be a possibility of removing it to some extent. Of course, there was the chance that attempts to remove it might make the face even worse.

DR. WALTER S. BARNES said that someone has made a suggestion that heat might liquefy the contents of the injected

material and permit it to be withdrawn with an aspirating needle.

DR. SHAMBAUGH thought that this applied more to the paraffin injections. His impression was that the lumpiness in the patient's face was more the result of connective tissue developments.

Leucoplakia of the Tongue.

DR. GEORGE W. BOOT presented a case of leucoplakia of the tongue in a man of about forty-two years, a peddler by occupation. Patient had had syphilis twelve years before, and had taken treatment for about three months. He had been a smoker, though not to excess. He has had no signs of syphilis since the three months of treatment. He presented himself for treatment because of a small painful spot on the side of the tongue. This had probably subsided under cleansing mouth washes, though the leucoplakia had been uninfluenced. The leucoplakia occupies chiefly the tip and borders of the tongue. It gives the patient no discomfort. Wassermann is reported as two plus. This case confirms the view that back of leucoplakia stands syphilis as the etiologic factor. This patient has been put on antisiphilitic medication, and it will be interesting to watch the effect on the leucoplakia.

Perichondritis of the Larynx.

DR. GEORGE W. BOOT presented a case of perichondritis of the larynx of unknown etiology. The patient is a butcher of about forty years of age. The trouble has existed for a year. He attributes it to catching cold going in and out of the ice box. He has had a tracheotomy done before coming under Dr. Boot's attention. The tracheotomy wound never completely healed. There remained a fistulous opening discharging pus. Later, swelling inside the larynx required reopening of the tracheotomy wound. When the tracheotomy tube was removed an up and down tube was inserted. After a couple of weeks this was removed. Patient did well for a time, when granulation tissue above the cords caused so much obstruction to respiration that it was removed by the indirect method. He now has plenty of room between the cords for respiration, but within the last two or three days a swelling has appeared between the epiglottis and the tongue on the left side. This has apparently opened and discharged pus.

In this case there is no suspicion of tuberculosis or malignancy.

Carcinoma of the Esophagus Rupturing Into the Aorta.

DR. GEORGE W. BOOT presented a specimen from an elderly man who had come to him for examination with the probable diagnosis of carcinoma of the esophagus. Dr. Boot passed the esophagoscope and found an ulcerating new growth near the middle of the esophagus. There was no bleeding from the examination. Two days later the patient had a sudden profuse hemorrhage and died. Postmortem examination showed an opening about one centimeter in diameter connecting the esophagus and the aorta. Only great gentleness in making the esophagoscopy could avoid hemorrhage at the time in such cases.

Carcinoma of the Epiglottis.

DR. GEORGE W. BOOT presented a specimen of carcinoma of the throat in which the growth appeared to have been primary in the epiglottis. The epiglottis was the size of a walnut. The new growth extended out into the right aryepiglottic fold and right pyriform fossa. The growth in the epiglottis blocked up the entrance of the larynx to such an extent that a tracheotomy was necessary on account of the valve-like action of the epiglottis.

The patient gave a history of having had antisiphilitic treatment for several months before coming under Dr. Boot's observation. In such a case as this early diagnosis of the nature of the growth and energetic surgical treatment should have made a cure possible.

Paper: The Tonsil Question in Children.*

BY GEORGE W. BOOT, M. D.

Paper: Clinical Problems Relating to the Faucial Tonsil in Adults.†

BY GEORGE E. SHAMBAUGH, M. D.

DISCUSSION.

DR. NORVAL H. PIERCE said it seemed to him that there was very little left to discuss. He heartily agreed with most of the

*See page 129. †See page 135.

things said in the two papers. He was happy to see that they condemned the massacre of the tonsils which had been going on. He thought that there was no doubt that there had been an enormous amount of unnecessary operations, especially in children. An adult can protect himself, but a child is the victim of his physician or overanxious parents. That is seen constantly at the dispensary of the Illinois Eye and Ear Infirmary and St. Luke's Hospital. He was sure he was right in saying that in the cases which he inspected immediately before operation, which had been prepared for operation, fully fifteen to twenty per cent were turned away and not operated upon. The visiting nurse and the physicians in charge of schools have been obsessed by the desire to remove all tonsillar tissue in the human race.

He considered the indications for tonsillectomies in the child to be about the same as those in the adult, with perhaps the exception that apparently in the minds of those in charge of children, all tonsils should be removed if they were at all enlarged. He agreed with Dr. Boot that the mere enlargement of a tonsil did not indicate operation. A tonsil can be quite large, but if it is not embedded and not the seat of recurrent attacks of inflammation, it should remain in the child.

As Dr. Boot had said, such tonsils very frequently undergo reduction in size very rapidly under syrup of iodid of iron or potassium. It is true that very little harm comes to a child from the removal of the tonsils other than the dangers necessarily dependent on the operation. It is remarkable how small a mortality there is in tonsillar operations, but he is quite sure that we do not accurately know the mortality. We accidentally hear about septic pneumonia, infarcts, hemorrhages, and sepsis, but very rarely read about them in the literature. He is quite sure that removing the tonsils in children must be a more or less dangerous operation; we know it is so in adults, and he believes we should be very circumspect in recommending any operation on the tonsil.

He thought Dr. Shambaugh had handled the question as to indications suffering from focal infections in a masterly manner. The crux in the matter in these adults he thought was represented in such a case as this: An internist sends a patient to a laryngologist for removal of the tonsils. He tells the

specialist that he has very carefully gone over the patient with Bright's disease, or neuritis, or a rheumatic type of disease, and has found absolutely nothing; therefore, the tonsils must bear the brunt of suspicion. He recommends the removal of the tonsils; there is no manifestation of local disease; there is no history of sore throat, or only a slight one now and then, nothing can be squeezed out of the tonsils—no cheesy matter or pus. They may or may not be embedded. Should we yield to the internist and remove these tonsils? He admitted that he had been guilty of yielding in this way, but he has yet to see in such cases any benefit whatever from such an operation. It is probably true, although personally he had never seen such a case, that tonsils had been removed in cases with focal infection symptoms, in which the tonsils before operation exhibited no sign of inflammation, yet the operator has found at the base of the tonsil, absolutely sequestered, a small abscess. He has seen cheesy matter deep in the tonsil that could not be expressed by pressure, but he has never seen a real abscess deep in the tonsil without manifestation of it in the tonsil before operation.

He differed with Dr. Boot's remarks as to the depth of an anesthesia. He believes it is infinitely safer for the patient and very much more agreeable to the operator if the patient is carried down to a deep anesthesia so that the pharyngeal reflexes are abolished. The danger of the anesthesia largely rests in the up and down stages; if a patient can be kept down in one stage, there is no doubt that there is less danger from the anesthetic. Gagging causes bleeding, it throws an additional load on the heart, it interferes with dissection, and he believes it is necessary to thoroughly anesthetize the patient before beginning and then carrying that stage on until the operation is completed. Of course, speed in the operation is a desideratum, but safety and thoroughness are greater.

He is impressed by his experience in these cases that the cheesy deposits constitute one of the main causes for removal of the tonsils. If one consideration or another causes him to hesitate and he finds the cheesy deposits, that is the one thing that would cause him to advise removal of the tonsils.

He has yet to see a good singer hurt in any way by a tonsillectomy well performed. He has seen young women who said

that their singing voices were entirely lost from removal of the tonsils, but he was in a position to know that they had never had a voice and never would have a voice. They were willing singers but not gifted singers.

DR. ELMER L. KENYON said that since the question of voice had been brought up, perhaps it was just as well to make a remark about it. Last winter he examined some forty or fifty tonsillectomized throats, with the purpose of determining exactly what had happened to the palatoglossus and palatopharyngeus muscles. In that series of cases five voices were found to have become permanently nasalized. That is a terrible percentage. If that ratio held in all operations, it would mean that one out of five had permanently nasalized voices; but of course that is impossible. These findings did not represent at all the true percentage, but they almost certainly did show that there was more injury to the speaking voice following tonsillectomy than any of us had thought. In all of these cases the trouble with the voice had resulted from a permanent injury to the palatopharyngeus muscle. That muscle had been pulled to one side and become adherent to the outer wall, with the effect that the soft palate was held down, making it impossible for it to move back to the posterior pharyngeal wall on phonation. Of course, one is likely to say that this happens only in badly performed operations. But these five cases were all done by different operators, some of whom he knew to be as capable of operating delicately on the tonsil as any operator anywhere; so it seems safe to say that it is not altogether bad operating that produces such results. It seems to him that such impairment to the palatopharyngeus may occur through infection following the operation as well as through injury to the palatopharyngeus muscle directly. If his hearers had studied the matter they would know that a very thin curtain of muscle remains to the posterior pillar after the removal of the tonsil, thus enabling slight injury to bring about a serious result. If no serious injury has occurred to the palatopharyngeus muscle from tonsillectomy, it may be that the voice can be handled very nearly as well following the operation as before. One has to bear in mind, however, that the tenseness of the neighborhood structures following operation is apt to be decided, and it was very difficult for him

to understand how a singer could handle a tense throat as well as a relaxed one.

It was perfectly evident, and had been shown by the speakers, that one great difficulty was to determine when we should or should not operate. If there was no clear reason for operating, it seemed to be a serious matter to do a tonsillectomy. It seemed to him that the need was to develop a conservative operation which would fit doubtful cases and cases where the voice ought to have especial consideration. He believed that it had never been shown that an intracapsular operation was not capable of being successful if it were a thorough operation. He believed that future development in this field lies in the direction of finding two operations: one, the operation which we do, and the other a more conservative operation, which runs no danger of death from hemorrhage, and no danger of serious impairment to the contiguous important muscular structures of the throat.

DR. LOUIS OSTROM (Rock Island, Illinois) said he would like to relieve his mind and also to present a grievance. We have had several men such as that prince of modifiers, Dr. Pyncheon, in this society, who have modified instruments, but he did not know that anyone had ever taken out a patent on a modification. Among these men are Drs. Beck, Freer, Ballenger, Boetcher, Tydings, Pierce, Ingals, etc. He had wanted a modification of the Sluder instrument made, but he was told that he could not get it because the idea of the dull blade had recently been patented. Several years ago, shortly after Sluder's first paper, Dr. Ballenger devised such an instrument, with one very dull blade and one sharp blade, the one to crush the base of the tonsil, the other to cut it off. Dr. Beck afterwards devised his snare for the same purpose. Last year at the American Medical Association meeting in Detroit, Dr. Makuen demonstrated a dull bladed Sluder guillotine, with which he uses a snare to slowly cut off the tonsil. Dr. Ostrom has had very bad hemorrhages in tonsillectomy by every method, and in cases where the tonsils were removed as clean and complete as they could be; but because he liked the Sluder method best, he made his original Sluder duller and duller, with the idea of crushing the blood vessels until he finally got it to about one-sixteenth of an inch; then finally he got to

a point where, after leaving the tonsil in the instrument for some time (ten minutes), he would cut it off, but it did not work satisfactorily, so he modified Sauer's idea by adding a stop to the forward movement of the blade, so that when the blade was tightened with the screw it did not break the distal ring of the instrument. After a wait of several months he finally got a modified Sluder-Sauer guillotine made, but could not get another because the instrument maker told him that Ballenger's original idea of the double bladed instrument with one very dull blade had recently been patented, and his idea of a dull blade in the Sluder instrument was an infringement of this patent. He has been using the instrument (modified Sluder-Sauer, which he demonstrated) for about two months, and has had no hemorrhages at all if the tonsillotome is retained for a sufficient length of time. Blood will not coagulate in much less than five or six minutes at best in the laboratory, or sometimes eight to ten minutes, and it is not reasonable to suppose that you can produce coagulation in the blood vessel ends in all cases by putting on a snare wire and cutting off the tonsil in less than eight to ten minutes. By using two instruments at the same time, both tonsils can be removed in two or three minutes, and the instruments left in place as long as you like. During this time the adenoids can be removed. If more instruments are at hand, several cases can be attended to in a very short time. The tonsil is simply shaved off the flat side of the guillotine with an ordinary scalpel.

His protest is that it is not, in his judgment, fair that anyone now should patent Ballenger's original idea without giving him any credit, and especially when the idea is only one of a dull crushing blade which in itself is as old as the hills. He is now able to have his modified Sluder-Sauer made, but it took a fight with the instrument maker. Another member of this society, who is also present at this meeting, tried to get one made exactly like the one Dr. Ostrom demonstrated, but was refused because the dull blade idea was recently patented.

Dr. Ostrom had another little idea which is a modification of the Cushing-Crowe silver clip. By putting a little wire in here (demonstrating) to control the hemorrhage, no other artery forceps is needed. If you have a bleeding point anywhere, you use the tongue depressor to find that bleeding point,

then, without using an artery forceps of any kind, you catch it and the little clip stays. He has used many of them, and they have never caused any trouble. He considered it the nicest little device for controlling hemorrhage that he knew of.

DR. HENRY F. HELMHOLZ had come to the meeting to get the opinions of the men as to tonsillectomies in infancy and childhood, and he thought most of the men will find that the pediatricians, as a rule, are conservative in their recommendation of tonsillectomy. He thought the difficulty has come rather from the side of the parents. Parents frequently bring in their children with somewhat enlarged tonsils and ask if they shall be removed. If the child is in good physical condition and the tonsils show nothing abnormal, it is not difficult to give advice. Where, however, the child is below par, where the tonsils look suspicious, it is difficult to say more than that the removal of the tonsils may be of some benefit to the child. The question then can be put up to the specialist as to whether or not these tonsils will be removed. He finds that his cases group themselves into cases where he absolutely recommends that the tonsils must come out, and those cases where it is difficult to make any decision.

There is the question of the removal of the tonsils within the first two years of life. He has had a number of cases where a child had to be sent to a specialist a second time because the first time the specialist said the child was too young to have them taken out. One should consider that the younger the child the more likely the lymphoid tissue is to develop; but in instances of follicular tonsillitis there has been a tremendous improvement in the general condition of the child after removal of the tonsils.

DR. C. H. LONG said that Dr. Boot referred to the time of removal of the tonsils with enlarged cervical glands which were probably due to tuberculosis without any lung focus. It has been his habit to remove these tonsils and give tuberculin afterward. Last May Dr. O. W. McMichael, of the Municipal Tuberculosis Sanitarium, stated to him that he gave tuberculin first and afterwards removed the tonsils. He would like to know if that is the custom.

In February, 1916, he did a tonsillectomy upon a teacher who had exceedingly large cervical glands which had been

present since the age of seven years. He expected to use tuberculin during the summer vacation, but the glands disappeared without it. The tuberculin test had been strongly positive.

Dr. Shambaugh spoke of the internist who referred the case to the specialist for operation. He would like to add one more specialist—the dentist. When adults are referred to Dr. Long by the internist, and there is any question about the tonsil being the source of the focal infection, he has the dentist exclude the teeth as a possible factor. The tonsils are then only removed when there can be no other cause discovered. The X-ray frequently indicates a root abscess when the patient has had no complaint of the teeth.

A young lady with a chronic sinus trouble, especially of the antrum, consulted him several months ago. He advised having a radiograph made, and saw no more of her until about a month ago, when she returned and consulted him about her eyes. She had consulted another specialist, and he had drained the antrum through the nose. The hole in the lateral wall had closed and the sinus was still discharging through the normal opening. He insisted upon a radiograph, which showed that the antrum was affected from the first molar tooth. She was referred to a dentist, who removed the tooth and the abscess cleared up promptly.

DR. H. I. LILLIE was much interested in Dr. Boot's assertion that the upright position in tonsil operations should be condemned. His training had all been in the upright position under ether, doing a knife and scissors operation. The anesthetic is given by the closed cone method, in the recumbent position, and the patient is put to sleep without much discomfort. He has had occasion to give many anesthetics, and to give them to doctors who believed, after the first few drops, that they were receiving chloroform. They never push the anesthesia beyond the pharyngeal reflex, and the patients are then put in the upright position. He considers it most important that the head must be held securely, as it is apt to drop. The advantages of this position are numerous: you see the tonsils in the same relation as when you examine the throat, the bleeding does not seem to be as great as in the recumbent position, the tongue does not interfere so much, and the bleeding is easily controlled.

In reviewing the literature last year he found a report of nine cases of lung abscess in which the authors concluded that the anesthesia was too deep, so that the blood went down the throat. In a series of cases in the upright position, it can be shown that there is no more blood in the larynx in this position than in the recumbent position. It is the contention of many men that the upright position should be condemned because the blood goes into the larynx, but as a matter of fact the blood goes down the pyriform fossæ and esophagus more easily than it does into the larynx.

Dr. Lillie believed that the stay of the patient in the hospital after a tonsillectomy is insufficient. Ordinarily twenty-four hours is the time recommended. Lung complications and septic complications do not show up in that length of time, and as most of the operations are done in the dispensaries or hospitals, these patients do not report back. He believed the time will come when the stay of a patient in the hospital will be increased to three days at least. In that time a lung infection or embolus will show up. In one case he had seen a lung embolus which no one could say was due to the upright position.

Regarding the question of pathology, most of their cases were in children, and they were fortunate enough to have a pathologic examination in every operated case, and it was surprising to note the percentage of tuberculous tonsils. The pathologist went over all the cases himself, and discovered that seven per cent of all operated cases in a series of nearly forty-seven hundred showed tubercular foci in the tonsils, the giant cell infiltration with occasionally tubercle bacilli.

Dr. ALFRED LEWY said that in a previous paper Dr. Shambaugh had called attention to tonsillar infection and lesions of the eighth nerve. He would like to ask under what conditions in cases of nerve deafness he would advocate removal of the tonsils.

Dr. GEORGE E. BAXTER said he had come with the idea of learning something about the attitude of specialists in nose and throat work in connection with tonsillectomies in children. He had been particularly pleased with the general sentiment of conservatism which seemed to pervade the meeting. He was also convinced that the last word in tonsil work had not

been said. Discussions as to the methods of operating had been going on for years, and would probably continue. There is a tremendous field for observations and conclusions as to the morbidity in children following an operation, and a field which naturally belongs to the pediatrician. Few specialists are in a position to follow their cases and learn the ultimate results of surgery of the tonsils. Not until a large group of cases, studied over a period of years, are observed can we arrive at proper indication for and value of tonsillectomy in the child. He felt also that a warning which had been mentioned should be emphasized, against the operations for removal of tonsils in infant life. Dr. Helmholtz had mentioned four cases where the indication for operation was definite—such indication must be most definite, and restricted in cases during the first two years.

Dr. Baxter felt also that too little cognizance had been taken of the postnasal tonsils. It is certain that large numbers of infections in the nasal and postnasal spaces, where the adenoid tissue is located, occur in the first two years of life. It is very common to come across children with running ears. These are not recognized as cases of otitis media until after there has been some external evidence. He was not yet convinced as to what was the best thing to do in these infants who have frequent severe infections in the postnasal spaces which frequently result in otitis media and cervical adenitis. Mention of the postnasal tonsil is made because of the close relationship with the faucial tonsils, and because adenoids are always operated at the time of the faucial tonsillectomy. This will admit of very much more study before coming to a definite understanding as to just what is best to do about tonsils and adenoids in young children and infants. Those cases for a long time have been sent to specialists without any particular recommendation other than the fact that the tonsils and adenoids are enlarged. His judgment was that we must come to some definite and concrete indication for operative work on the tonsils in children and infants.

DR. W. A. MANN said he had been listening with a great deal of interest to the discussion of the papers, and he agreed with most of the statements. However, he felt that the statement that a large number of tonsils are removed unnecessarily

should be confined to the general practitioner or surgeon who is not a throat specialist. He thought the specialists were very careful. His experience is that patients are sent by general practitioners for operation, but if there is no sign of disease he advises the patient to wait. Yet in a lot of these cases there has been evidence of infection within two or three years, so where there is any evidence at all he thinks it is a good thing, as a matter of prevention, to take the tonsils out. If the operation is properly done, it will do no harm and may do a lot of good.

DR. ARTHUR R. ELLIOTT said that in common with other internists he felt a great interest in the tonsil problem. He had no opinion to express as to the removal of the tonsils in children, as that was not within his scope. He could only express a personal conclusion in the matter of tonsil operations in adults. As the result of such personal experience as he had had he had come to several different conclusions to serve as a working basis. The first principle which outlined itself to his mind very definitely was one regarding the removal of tonsils in cardiac disease, using that term as being more conclusive than endocarditis, although endocarditis and pericarditis would include the majority of cases he had in mind. He thought that the tonsils should be removed where they appeared to be pathologic, or in all individuals who have valvular disease, irrespective of whether the endocarditis can be traced to the preceding tonsillar infection or not. The ground for such a statement would appear perhaps upon consideration of the fact that the tonsil and other lymphoid tissue comprises the portal of entry of the streptococci infection, since we know how much it is to be feared. Throat infections in individuals who have, especially in their valves, a point of low resistance are always a source of danger. Cases of malignant endocarditis, and the extremely virulent type of endocarditis known as subacute bacterial endocarditis, occur only in individuals who have had previous endocardial infection, and he believed it a thoroughly good practice to advise removal of the tonsils in all individuals who have valvular disease, as a prophylactic measure.

Regarding the removal of the tonsils in chronic internal disease, such as arthritis, nephritis, diabetes, etc., we have often

to include the tonsil under the doctrine of the importance of focal infection which has been so prominent in recent medical thought. As Dr. Pierce had stated, the internist is often put to the last resort of considering the tonsil as the possible criminal in cases of this sort, and resorts to the process of "passing the buck" to the laryngologist. He entirely agreed with Dr. Pierce, that where the tonsils had been removed simply as a last resort in seeking for some escape from a difficult situation, without there being some obvious reason other than to serve an end, no good was accomplished. The removal of tonsils from which can be expressed purulent or sero-purulent material, or tonsils which are the seat of recurrent infections, is of the greatest benefit and results in much improvement.

As to the depth of the anesthesia, he was sure it was of great importance. Nature has established a guard in the throat in the laryngeal reflex, which keeps us from inhaling foreign material, and if we abolish this reflex during our operations we open up the way for inhalation of infectious material. He was sure that lung abscesses are caused by the inhalation of such material.

He thought Dr. Kenyon was right. No matter how carefully the operation is done, there is bound to be a considerable scar; and if the palatopharyngeus muscle is caught in this scar, there is bound to be damage.

He had the pleasure of seeing Dr. Ostrom operate by the use of his new instruments, and there was not so much as a drop of blood lost. His chief objection to the method is that if the instruments are used and left on for fifteen minutes, more anesthetic is required than would otherwise be used.

If all men who refer patients to the throat specialists were as careful as Dr. Helmholtz, we would have no quarrel with them about who should be operated upon.

As to the method of anesthesia: at the Children's Memorial Hospital they use an ordinary paper cone with a towel around it and a little gauze inside. This is the method he prefers. Dr. Lillie uses a metal cone which is very similar. He does not like ether given for tonsillectomy by the drop method. The anesthetic is of great importance, and the more rapidly the patient is put to sleep the less anesthetic is required and the less time the ether has to become fixed in the tissues.

DR. SHAMBAUGH, in closing, said that the discussions had touched very little upon questions presented in his paper. The problem for the throat specialists is to decide whether the tonsils are infected in cases of systemic infection. This can often be determined from the history—as, for example, where there has been an acute tonsillitis complicated by rheumatism, endocarditis, or Bright's disease. In most of the cases, however, the onset of the systemic trouble is not associated definitely with acute tonsillitis. He stated that he had seen a patient this morning whose tonsils he had removed three years ago because of persistent neuritis of the brachial nerves on both sides. The trouble began in childhood, and the woman was now forty-five. The suffering had been much worse in recent years. During this period she had had no tonsillitis, but was subject to it in early childhood. The tonsils showed no superficial evidence of infection, but after removal, a number of small abscesses were found in the depths of the tonsil, containing streptococcus viridens. Within six weeks after the removal of the tonsils the neuritis disappeared and she has had no return. He recalled another case on which he had operated several years ago because of persistent neuritis of the right arm, of ten years' duration. The patient had never had tonsillitis or sore throat, and no evidences of infection could be detected about the tonsil; not even the cheesy plugs in the crypts were discovered. The operation was performed on the advice of the internist, because no other focus was detected. While operating a small abscess in the left tonsil was opened. The patient has made a complete recovery and has had no return of the neuritis. These are the most difficult cases to handle: where the tonsils show no evidences of persistent infection, and where there is nothing in the history that would throw suspicion upon the tonsils.

As to a relationship between nasal infection and tonsillitis: it is entirely possible that a chronic accessory sinus infection may constitute the carrier of infection, which could cause recurring attacks of acute tonsillitis. It is much more frequent, however, to find the reverse true. Patients suffer from recurring infectious head colds because of the persistent infection in the faucial tonsils. The removal of the infected tonsils often puts a stop to this tendency.

Dr. Shambaugh was asked to say something about indications for tonsil operation in cases of neuritis of the eighth nerve. In reply he stated that a degenerative neuritis of the eighth nerve is responsible for a great many cases of nerve deafness, and especially for those cases where attacks of vertigo occur. Formerly, these attacks were supposed to be due to hemorrhage into the labyrinth, or to a condition of angioneurosis. Neuritis of the eighth nerve occurs as a sequel of the acute infectious fevers. Occasionally it results from drug poisoning, tobacco or alcohol, but very often there is no apparent cause, and it is the opinion of the speaker that in these latter cases focal infection may frequently be the cause of the degenerative process in the eighth nerve, producing nerve deafness and tinnitus aurium, punctuated often by attacks of acute exacerbation, during which vertigo will be a symptom, provided the vestibular nerve is involved. In cases of chronic progressive nerve deafness, where a degenerative neuritis of the eighth nerve seems to be the cause, the case should be examined for possible foci of infection. If the tonsils are found distinctly infected, we should be guided as to their removal exactly as in cases of neuritis involving other nerves.

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL
SOCIETY.

Meeting of December 19, 1916.

DR. OTIS H. MACLAY, THE PRESIDENT, IN THE CHAIR.

Case of Falsetto Voice.

DR. ELMER L. KENYON presented a boy of nineteen years with a falsetto voice which had been present since the age of fourteen.

Paper: Salient Facts Regarding Tonsils in Children and Adults.*

BY JOSEPH C. BECK, M. D.

(A reply to the papers and discussion of the last meeting.)

DISCUSSION.

DR. NORVAL H. PIERCE said he felt greatly relieved at the mildness of Dr. Beck's remarks. He had heard that Dr. Beck had been so incensed by something in the papers and discussion at the last meeting that he had feared to voice his displeasure at the time, and so allowed himself a month in which to quiet down. As a matter of fact, he did not see where he had replied to anything or done anything beyond giving his own views regarding certain matters, which are admirable. Still, his paper did bring out points for discussion. The axiom which he voiced at the beginning of his paper, "that a tonsil is better out than in," Dr. Pierce disagreed with. If we accepted such a position, it would eliminate all intelligent consideration of the subject. It would be very easy, if a patient came to you with a pair of tonsils, without any further consideration, to say, "Your tonsils must be removed." That mode of action has brought numerous procedures into disrepute. It is a position which surgical men have condemned in all branches, and it is the very turning point between humanely directed

*See page 149.

effort in medical practice and the veriest quack, who has nothing in view but his fees. There is something besides merely removing the tonsils; there is the danger that the patient is exposed to—a danger which has not been properly appreciated. The danger from the anesthetic and of shock, whether local or general; the danger of sepsis, the danger of pneumonia, etc.; and every patient who is subjected to tonsillectomy is liable to all these dangers. But aside from that, Dr. Pierce still claimed that the tonsil must perform some function in the human economy. This is shown by the fact Dr. Beck brought out—that even after a very careful, complete tonsillectomy there will be most pronounced hyperplasia. Nature is trying to do something to take the place of the excised tonsillar tissue.

As to age, Dr. Pierce was somewhat changed in his ideas regarding age being a counter indication to the removal of tonsils. In the last six months he had, in three cases, removed tonsils from children varying in age from two to three and a half years. They were children who had large tonsils, with repeated attacks of inflammation, who were not doing well, and the physician who had them in charge rather insisted that the tonsils be removed, and he removed them—with the most gratifying results. So he had decided that perhaps the age of the patient did not matter, if there is the indication for removal; but the indication for removal should always be present. The patient with tonsils is better off with the tonsils, Dr. Pierce believed, than without them, if the tonsils are not diseased.

Dr. Beck had touched upon the painful sore throat that followed tonsillectomies. The speaker had had some cases in which this had been a source of great annoyance, both to him and to the patient. He admitted that they had occurred in neurasthenics, men and women of pronounced hyperesthetic constitutions, but their sufferings had been real, and he had done everything that he could to relieve them, and yet the pain in the throat, which was not referred especially to the tonsillar region, but rather below, had persisted. He had explained this in his mind by supposing that the nerves in contact with the tonsillar capsules had been caught in scar tissue, thus causing a radiating pain low down in the throat.

Dr. Beck had spoken of the depth of anesthesia. With the insight of an artist he had said that he operates in a stage that is neither deep nor superficial, in which the laryngeal reflex is retained. That is the point of digression between Dr. Pierce's views and his. The operation is infinitely more difficult when the patient is retching than when the reflex is abolished. The hemorrhage is greater, the accuracy of the incision very greatly interfered with; and he reiterated his view that it is safer for the patient, and much more agreeable for the operator, if the laryngeal reflex is abolished.

As to the connection between otosclerosis and the tonsils, Dr. Pierce considered that purely hypothetical, and would not discuss it pro or con; he would only say with the utmost earnestness that it is purely a dream. There is no one fact that can be brought out to prove that there is a connection between the tonsils and the otosclerosis.

As to the connection between the tonsils and poliomyelitis, he believed that possibly we are on the threshold of very interesting disclosures. Many experiments have been performed, but Dr. Pierce thought they were still in such a primitive stage that they should hardly be brought out before such a discussion as this.

DR. ARTHUR M. CORWIN said he did not hear the papers and the discussion at the last meeting, but whatever their import, the result was good in stimulating Dr. Beck's present effort in a paper at once comprehensive and rich in the experience of the essayist. He believed the essayist eminently sane, and also Dr. Pierce, in most respects. He did not know that this discussion was needed in the laryngological society. He believed every man in the room was so thoroughly posted upon the tonsil from many angles, that there could not be wide disagreement among them regarding the reasons for a thorough tonsillectomy. When a patient comes into his office, and in the routine way he looks over that patient from bald spot to toe nails, as a laryngologist should, and becomes thoroughly acquainted with that patient—not through a narrow slit, but broadly viewed as an entity—he knows whether he ought to advise the removal of those tonsils or not, whatever the age of the patient. Seventy years or eighteen months was not a bar, in the presence of weighty indication for bettering the patient, reasons local, regional and systemic.

As to the minor differences: in a great subject like this, the difference in technic in handling hemorrhage, the procedure in operating the patient, the kind of anesthesia, those things will vary as widely as the shape of the noses in this room. While we each have our favorite method, we none of us are infallible. However good a man thinks his technic—however good his average results—if he will go and see others operate, it will do him more good than the reading of volumes or listening to hours of discussion. He did not wish to prolong the talk or bring out his own hobbies for exhibition purposes. But he differed in the way of controlling hemorrhage; never did he sew pillars together, never yet in many thousands of cases, old and young, did he have to ligate an artery in the throat. No matter how much one talked, one fellow would go on ligating and another fellow handle it in a different way. The thing is to take a tonsil out in the technically best and most complete way we know how—for the right kind of a fee.

DR. ELMER L. KENYON said it seemed to him that one could not talk in a final manner upon any subject where the knowledge was not yet complete, and certainly it was not complete concerning what we did, or might do, to the structures of the tonsil outside the capsule. He knew, for instance, that the palatoglossus muscle was in more than fifty per cent of the operations rendered partly or wholly incompetent, but he did not know of how much importance this muscle was to the speech. He believed that he knew that the so-called capsule of the tonsil could not be operated with any accuracy from the intrapharyngeal aponeurosis, and he thought he knew that in most cases the integrity of the palatoglossus was dependent upon the retention of at least the intrapharyngeal aponeurosis, and often the integrity of the palatopharyngeus as well. He knew from personal knowledge that the palatopharyngeus muscle had been in certain cases so badly destroyed, and the resulting scar tissue so harmful to the soft palate, as to render the patient's voice permanently impaired, even though the operation had been done by very skillful hands. From the standpoint of the singing voice, nobody knows just the value of the palate muscles in the production of the singing voice, but in all probability the palatopharyngeus especially is of importance.

DR. GEORGE W. BOOT believed that most of what Dr. Pierce and Dr. Beck had said was right, but he must disagree with part of Dr. Beck's statements. He had recently attended a meeting where one of the doctors urged that the people get the "tonsil habit." He thought it a bad habit for the people to get. It is bad enough for the doctors to get the habit. One of the first things impressed on him as a student of medicine was to do his patient no harm, even though he did him no good. He thought no one could deny that in removing tonsils the patient was subjected to some danger. Occasionally lung abscesses have followed tonsillectomy, and there are all manner of other bad effects that are seen, such as absence of the uvula, soft palate, artificial cleft palate, and so on; so that we can hardly deny the danger of the operation, and we have no right to subject our patients to such danger without justification. These results are not always from the work of beginners, but some of them have followed the work of very good men, and he thought one should be very careful in urging the laity to get the "tonsil habit."

DR. P. J. H. FARRELL said that Dr. Pierce had referred to the question of the anesthetic; he thought it was a well known fact that a complete anesthesia was the one which gave the least shock and danger; that applied to the throat as well as elsewhere.

In referring to what Dr. Boot said, the implication was to have school children examined thoroughly, including an examination of the eyes, ears, nose and throat. It was simply a matter of a thorough examination. He is chairman of that committee. The tonsil is the least important, as regarded from the standpoint of school children. Dr. Farrell had heard only the last few paragraphs of Dr. Beck's paper; he thought that no case of neuritis was ever cured by operating on the tonsils. Every case of neuritis was self limited, and just as apt to clear up today as tomorrow, whether there was an operation or no operation.

Another point which Dr. Kenyon mentioned was the effect of a tonsillectomy on the voice. Dr. Farrell was sure that no adult voice has ever been improved by a tonsil operation, and that many thousands of valuable voices have been ruined by operations upon the tonsils. Some patients will say that

their voice is better, but they had no voice of value, either before or after operation. Many voices that return large incomes are ruined, their commercial value destroyed, by operations upon the tonsil; and the speaker thought one should be very conservative about operating upon the tonsils of professional singers or speakers. Dr. Farrell said most of the members present knew that he spoke from a very intimate knowledge of both sides of this question. In examining the throats of singers we find that the great majority of them have large tonsils, and the greater the amount of power the larger is the tonsil and the greater the resonance and vibration. If the palatopharyngeus muscle is destroyed, the case is hopeless, so far as restoring the voice of the singer or public speaker is concerned.

DR. ROBERT SONNENSCHNEN said he would take the liberty of speaking in regard to Dr. Corwin's remarks. He had followed his suggestion about seeing other men operate and had learned many things. He had seen Dr. Corwin operate by the Sluder method, and he had used the same method, but he could not understand how it was that he had never had to ligate a vessel. With the most careful technic, Dr. Sonnenschein had found it impossible to avoid ligation in some cases.

DR. ARTHUR M. CORWIN, replying to Dr. Sonnenschein, stated that the ordinary technic which he followed for control of hemorrhage was to operate the patient standing at the patient's right. As soon as he removed the patient's left tonsil, his assistant on the left of the patient went in with his finger wrapped with gauze, instantly controlling all hemorrhage. He then reached for the Corwin tonsil hemostat, which was fitted with a good sized pad that would fill the sinus, being larger or smaller, according to the case. That was put in immediately, carrying a little styptic—twenty-five per cent of tincture of iron in glycerin. He then went after the other, the near tonsil, in the same manner. If he was operating for adenoids, he went around on the other side of the patient and got the whole thing out in five lobes, with one application of the Stubbs curette manipulation, with a side to side and downward motion and a quick pull at the end. With the patient's head held so that the mouth was below the operation field, all bleeding into the larynx was prevented, and the adenoid invariably

dropped out of the mouth as it was cut out with the last motion of the curette.

Dr. Corwin said the hemorrhage could be controlled by these hemostats, finger and sponge carrier, by a little judicious pressure; sometimes it takes a little more or sometimes a little less, but before the patient leaves the operating room, and before the operator leaves the hospital, he always sees that the hemorrhage has ceased. He has never had to ligate the vessels or sew the pillars together. He did not wish to say that those things were not right to do semioccasionally; but thought them inadvisable in routine. He thought a dogmatic attitude for or against measures that proved satisfactory to others and gave good results, was something a free-minded man should not have toward the other fellow, if he did not want the other fellow to bark and growl dogmatically at him.

Dr. Beck, in closing the discussion, said that if he had given the impression of operating every patient he saw, he wished to correct it. Tonsils were only taken out of patients when he thought they needed to have them taken out. He said his broad statement that everybody's tonsils would be better out than in was made because we do not know the function of the tonsil, except to know that it causes a lot of trouble. We believe it is a cause of disease—it is a nidus for infection, except for the first few years, when there is a hyperplasia. He believed that early in life such tonsils had something to do with the thyroid and thymus, and therefore he did not believe in removing them at that time.

So far as the dangers are concerned, they are not at all alarming, if you know how to handle the patient, in the opinion of Dr. Beck. He said that if his paper was going out as a "get the tonsil habit" paper, he was not going to publish it. He certainly did not agree with any tonsil habit or anything of the kind. Every point which has been made about the danger of hemorrhage, etc., he forestalled by strictly surgical measures. No matter whether the hemorrhage was stopped by pressure or by ligation at the time of operation, when the patient was returned to bed and began to use the muscles, fresh bleeding occurred, and the patient inhaled or swallowed the blood; and Dr. Beck thought if many of the abscesses that are reported were looked into, it would be found that they were due to this fact.

The hyperplasia following the removal of the tonsil in adults was not, in Dr. Beck's opinion, an indication that the tonsil had a function; it was not a compensatory hyperplasia. He said that in most cases they did not operate until the third year, but in quite a number of cases the compensatory hyperplasia would follow at or before that age.

He believed, with Dr. Pierce, that otosclerosis had nothing to do with the tonsils as a local process, but he did think that the chronic infection had to do with whatever caused otosclerosis, and he thought that his cases of otosclerosis were better with the tonsils removed than with them present. This opinion was based on twenty-five or thirty cases.

In regard to the anesthesia: in their cases the laryngeal reflexes were never allowed to be abolished, but the pharyngeal reflexes were abolished. Dr. Pierce had probably misunderstood him.

Dr. Beck thought that poliomyelitis in connection with the tonsils should be mentioned in scientific meetings like these, because work had been done by Nuzum and Rosenow, two scientific gentlemen, and we should know about it at least. He had not expressed his personal views on the subject at all; in fact, he had none. He thought that everyone agreed that everybody had his own way of operating, and yet would like to hear about the other fellow's way, was the answer to those gentlemen who think the technic of tonsil operation is a closed chapter. To Dr. Beck it was far from it, and he was changing his technic quite often—however, sticking to the principles very closely.

Dr. Sonnenschein in his remarks had touched upon the point of ligation. Dr. Beck did not see why one did or should not have to ligate a "spurter"; he considered that preferable to going to the patient's room and using more pressure. As to the quickness of operating, he considered that a good point, not on account of the time, but because he thought every operation should be done as quickly as possible. Certain conditions might require half an hour to finish the operation.

Dr. Kenyon had mentioned the aponeurosis. In every case where the Sluder technic is used, one can see the split capsule in which the aponeurosis is separated from the capsule. It matters not what movement is employed.

As to the voice, Dr. Beck had noticed that Dr. Farrell's voice was much better since his tonsils had been removed. Dr. Farrell had said that no case of neuritis had ever been cured by a tonsillectomy. Dr. Beck agreed that no alcoholic or pressure neuritis had been cured, but infectious neuritis was due in most instances to a focal infection from some place, and the neuritis disappeared after the focus was removed; they had had many of those cases, and he was sure that others had likewise.

Paper: Acute Suppurating Mastoiditis Without Tympanitis, Perisinus Abscess. Phlebitis and Streptococcemia—Operation and Recovery.

DR. CHARLES H. LONG said that acute inflammation of the mastoid process, accompanying or following suppuration of the middle ear, was a common occurrence, but was rather rare when there was an insignificant cause and no discharge from the external auditory meatus. He reported the case of a female patient, aged twelve years, who entered the Postgraduate Hospital on May 5, 1916, suffering from chills, fever, vomiting, great prostration, and severe pain in the left ear. She had had a severe head cold about the middle of April, and later in the month complained of being very chilly. On the afternoon of May 1st, severe pain in the left ear developed, and in spite of treatment the patient grew gradually worse.

On May 5th there was temperature of 104.2° F.; pulse, 120; respirations, 36; no meatal discharge, no tympanitis, membrane red and injected, the nose and throat normal. The ear drum was freely incised, a wick drain inserted, and external dry heat applied to the mastoid. After the paracentesis the pain moved to the opposite side of the head, and continued with great severity until relieved by aspirin. The gauze was removed from the meatus, discolored with only dry blood from the incision. The following two days she was free from head pain but more toxemic, sleepless and delirious. There was great variation of temperature, the maximum being 104.6° F., at noon. She was then seized with pain in the region of the appendix and there was involuntary urination. Blood count gave a leucocytosis of 16,000.

On the 9th she was seen by a neurologist, who diagnosed lateral sinus thrombosis. No X-ray taken. Indications of meningitis were more pronounced.

On the 11th the simple mastoid operation was performed; the inner table was very soft, necrotic, the greater portion being removed with the curette, exposing small pools of pus and masses of exudate which hid the sinus from view. The bone was removed in every direction until healthy dura appeared. With the vein uncovered an examination of the sinus was made with a curved applicator, but it seemed to be free from coagula. To make certain, a long incision was made in the sinus; the blood gushed freely from both ends, no clots appeared, and the hemorrhage was controlled by packing.

On the 13th spinal puncture revealed the spinal fluid normal and not under increased pressure. Following this the patient made an uneventful recovery, leaving the hospital June 3d.

Dr. Long thought that nose and throat cleansing solutions often did more harm than good, and that as prophylactic measures in ear infections they were worse than useless.

DISCUSSION.

DR. GEORGE W. BOOT agreed most heartily with what Dr. Long had said about the use of irrigation of the nose in these nasal infections, and wished to call attention to what had happened at the County Hospital as the result of stopping nasal irrigations in scarlet fever infections. Three years ago it was the rule that every patient with scarlet fever should have the nose irrigated. Two years ago this was stopped, and they had had practically no mastoid operations in the scarlet fever wards since.

DR. L. J. HUGHES, of Elgin, reported the case of a man of thirty-eight years, who was working in a Borden plant in a rather damp place. He had a cold, and complained some of his hearing and ran a temperature for some time. The doctor had suspected a middle ear involvement, but was unable to demonstrate anything positive, and carried the patient along for four or five days, until he developed a tenderness over the antrum. The ear drum was practically normal, had no apparent signs of trouble in the middle ear. As soon as the mastoid showed signs of tenderness he incised the membrane, and immediately pus flowed out under high pressure. Under local irrigation and wick drain the condition cleared up without further trouble, but it was very hard to localize the infection.

It was only when the man developed mastoid tenderness that the doctor was sure of his ground.

Dr. JOSEPH C. BECK said he had had no experience in such a case as Dr. Long's, but as the doctor was reading his paper he was reminded of a case of so-called primary mastoiditis with sinus thrombosis, where there was no history of a cold or anything in the nose or throat. Chills and fever were present, and there was a suspicion of malaria, because the patient came from the South. The blood examination proved the point that it was not a malaria but a septic process. There was a high leucocyte count, and in that case they waited for a time, because there was not even tenderness about the mastoid, but there was a history that there had been a suppuration in the ear long before. Examination of the ear and hearing were normal. The patient was in the hospital, and they made an X-ray examination which showed a typically sclerosed mastoid. They operated and found a picture much as Dr. Long had described. He thought that in cases where a patient had chills and fever which did not stop, and the blood examination did not show anything to account for it, an exploratory sinus operation should be performed. He thought it would do much less harm to expose the sinus and have a look at it than to wait a week with meningeal symptoms developing.

Dr. LONG, in closing, said, in regard to operating sooner than he had, that in the case of a patient whom he saw last week, he made a very strong statement that he would have to operate, and the patient did not return. In the other case he did not have the full history at the time he first saw her; he had no history of a head cold. Dr. Black would see her one day and then would not see her for two or three days—and so it was postponed.

In regard to the malarial cases, there were several cases in the literature where there had been symptoms of mastoiditis, or symptoms simulating mastoiditis, which were due to malaria. Some of them were diagnosed by examination of the blood and no operation performed. Dr. Long knew that some of those cases were operated when the blood was not examined.

ABSTRACT OF THE REPORT OF THE SCIENTIFIC
PROCEEDINGS OF THE THIRTY-EIGHTH AN-
NUAL CONGRESS OF THE AMERICAN LAR-
YNGOLOGICAL ASSOCIATION.

HELD AT WASHINGTON, D. C., MAY 9, 10, AND 11, 1916.

EMIL MAYER, M. D., ABSTRACT EDITOR,

NEW YORK.

President's Address.

The President, Dr. G. Hudson-Makuen of Philadelphia, took as his subject:

The Psychology of Diseases of the Respiratory Tract.

While the specialty of laryngology is dependent upon all the various specialties in medicine, its future progress and development depends chiefly upon a knowledge of psychology and its related branch, neurology.

Psychotherapy has been practiced after a fashion since the beginning of the history of medicine, but it has not kept pace with the other forms, the chief reason for this being that the successful practice of psychotherapy requires on the part of the practitioner the profoundest knowledge of both medicine and man, and especially man. Few physicians are mentally and temperamentally capable of practicing psychotherapy, and the improved curricula of the schools do not supply the rising generation of specialists with the assistance which they should have.

Since many of the diseases of the respiratory tract are purely functional and of psychic origin, the laryngologist should be able to distinguish between those of his patients who are psychopaths and neuropaths and those who are suffering from actual organic diseases. He should realize that to treat a purely psychic case by physic measures is not only useless but in many instances absolutely harmful, and to operate merely for the psychic effect of the operation is exceedingly questionable surgery.

Psychotherapy in the form of education and reeducation should always be used, in addition to the necessary medical and surgical measures, for the relief of disturbed respiratory, phonatory and articulatory functions. It is not enough to do operations for the correction of disturbed functions without at the same time or immediately thereafter doing something in an educational way to correct the faulty habits which accompany, either as cause or result, the conditions that we are seeking to modify or cure. An example of the psychophysis habits that arise owing to functional disturbances due to organic lesions is found in the speech of the patient having a cleft palate. When this characteristic speech has developed, no amount of adequacy or efficiency of the palate brought about by operative measures can in itself appreciably change or improve the speech, because the individual accepts his old speech as normal speech.

This principle obtains in all our operations upon the respiratory tract, the object of which is to correct faulty functionation. Its value is apparent in dealing with disorders of speech, the treatment of which differs not from other disorders of the respiratory tract. Formerly, distinguished surgeons operated not alone upon diseases and abnormal structures, but also upon perfectly normal structures, not hesitating to remove cross sections of the tongue and epiglottis, in the hope of curing stammering. To us of the present day this is absurd, for we know that stammering in the great majority of instances is of psychic and not of physis origin, and to cure the affection psychotherapy is quite as important as physiotherapy. What is true of stammering is also true of the other forms of defects of speech.

As the medical profession has been slow in recognizing that stammering and other defects of speech are largely of psychopathic origin and require for their cure psychotherapeutic measures, so have we been slow in recognizing that many forms of asthma, sore throat, and difficult nasal breathing are of similar origin and require similar treatment.

In no specialty of medicine is the importance of these matters so apparent as in our own, for in no specialty is the psychic element so great a factor in the causation not only of functional but of organic disorders as well. In this connection

it must not be overlooked that faulty methods of breathing, vocalization, and articulation, although at first of psychic origin, frequently result in organic diseases which cannot be differentiated from diseases having purely physical bases.

A study of the psychobiologic phenomena as they appear in a given individual is merely a study of his reactions to his environment; or, in other words, a study of what has been called his mentation, behavior, and personality.

The new psychology, therefore, teaches us not merely how to treat diseases of special organs, but it teaches us how to treat the patient himself or the reactions of the patient to these particular diseases. A knowledge of this psychology will broaden the scope of our work, and it will tend to make a medical education absolutely necessary to those desiring to practice the various forms of the healing art; but so long as physicians generally disregard this fact, so long shall we have nonmedical practitioners, such as Christian scientists, osteopaths, hydropaths, and all the others of their kind, actually invading our field of operation.

On the Relation of Diseases of the Accessory Sinuses to Diseases of the Eye, Especially in Children, With a Report of Two Cases.

By J. H. BRYAN, M. D.,

WASHINGTON, D. C.

Diseases of the sinuses occurring in children have been only slightly considered, for the reason that these cavities in the very young are supposed to be so small that there could not be an inflammation sufficiently severe to cause any serious disturbance of the eye.

That these premises are entirely wrong is evidenced by the report of the following cases:

Case 1.—A male, aged eighteen months, had a very marked exophthalmos on the left side following an infection from influenza.

On admission to hospital his temperature was one hundred and four degrees, some secretion flowing from the left nostril, marked bulging of the left eye downward and outward, lids and conjunctivæ were edematous, and the periauricular glands were enlarged.

Seen by the speaker in consultation, the diagnosis of orbital abscess resulting from an infection through the ethmoid cells was made.

The radical operation was then done, the incision commencing at the junction of the middle and outer third of the supra-orbital ridge, and was carried inward and downward along the inner border of the nose below its middle. The periosteum along the inner wall and the corresponding parts of the roof of the orbit was stripped from the bone, and in doing so a large quantity of pus was evacuated. The whole of the inner wall of the orbit was removed back as far as the sphenoid. The ethmoid cells were found to be badly diseased, especially the middle and posterior portion, and from the condition found it was apparent the orbital abscess resulted from a direct infection from the middle and posterior ethmoid cells. The amount of pus evacuated was enormous, when we take into consideration the age of the child and the stage of development of these parts at this age. The abscess having been thoroughly evacuated, a strip of iodoform gauze was placed in the orbit back of the eye and brought out through the nose, and a small gauze drain was placed just inside of the inner canthus, and the external wound closed by interrupted sutures.

The child made an uninterrupted and quick recovery, the eye gradually receding soon assumed its normal position. This is the youngest patient the speaker had ever seen with such diseased conditions.

Case 2.—Negro boy, aged eleven years, had bulging of the left eye to a marked degree downward and outward. An absence of pus anywhere within the nose and no signs of caries or necrosis.

X-ray examination showed no abnormality except that the left orbital cavity was apparently filled with a dense mass which seemed confined to the orbit.

Because of all these negative examinations it was believed that there was a growth in the orbit back of the eye.

An exploration of the orbit showed that at the junction of the middle and posterior portion there was a decided bulging of the ethmoid toward the orbit. With a probe the cells were perforated, and a large quantity of pus was evacuated. The whole of the inner wall of the orbit, including all the ethmoid

cells, were removed as far back as the sphenoid, and in doing so a large abscess involving the posterior ethmoid cells and the sphenoidal sinus was found. The sphenoidal cavity was unusually developed and filled with thick, creamy pus. All diseased bone and purulent secretion having been thoroughly removed, an iodoform gauze packing was placed in the sphenoid and ethmoid regions, one end being brought out through the nose and the external wound closed by interrupted sutures. At the end of the second day the gauze drain was removed and the nose gently irrigated with a saturated solution of boracic acid.

The patient made a quick recovery, the eye gradually receding within the orbit, and at the end of the ninth day he was discharged from the hospital.

Case 3.—Male, aged thirty-six years, had thrombosis of the cavernous sinuses. Under ether anesthesia he removed the middle turbinals and opened both sphenoidal sinuses, finding some mucopurulent secretion in both cavities. Examination of the secretion taken from the sphenoidal sinuses showed both streptococci and staphylococci present. A lumbar puncture showed the spinal fluid under great pressure, filled with pus cells, roughly estimated at 40,000 per millimeter. Polymorphonuclear leucocytes predominated. The condition of the patient grew rapidly worse and he died.

Postmortem Examination.—The head only examined, showed all the sinuses contained dark and semifluid blood; small hemorrhages on the right half of the cribriform plate of the ethmoid bone. Vessels of the pia mater generally engorged, the basilar surface of the brain showed fibrin and a purulent exudate under the pia, especially on the insula and adjacent opercula. A microscopic examination showed the vessels of the brain engorged. Beneath the membrane was a thin layer of brown material intimately adherent to the brain substance beneath. On section the brain substance showed brownish points near the surface, the brown exudate under the membrane showed fibrin, red blood cells and mono- and polymorphonuclear round cells.

DISCUSSION.

DR. LEWIS A. COFFIN, New York City: Dr. Bryan's experience is unique, I think, in the extreme youth of his first

patient—eighteen months old. My youngest patient was six years old.

I have reported a case before this society in Boston, a case of thrombosis sinus cavernosus, upon which I had operated. That case has been very instructive to me. I think we lose sight of the fact that these ethmoidal veins for the most part empty into the ophthalmic veins. Now, if we know anything at all about a thrombus and its cause, where is there a more favored place for it to develop?

Then there is another thing—when we operate those cases, they bleed very profusely. Why other cases do not bleed the way they do, I cannot tell. I am reminded of the case of a girl who was absolutely blind in one eye four weeks, with a choked disc. I did a radical operation on her, and it was absolutely impossible for the man with me to sponge it so that I could see from the field of operation. I have had several of those cases of serious bleeding, just the same as if you put a stricture around the leg.

To return to that case of cavernous sinus which was so interesting and instructive to me. Dr. Coakley saw that patient in consultation with me, and we both felt acute sphenoidal sinusitis was present. Another consultant said: "We think you have probably saved her life by the great bleeding."

What I am going to do now with these cases is to give treatment in the shape of great big doses of lemons and lemonade.

I recall one case which was referred to me in which I really could not make out much sinus trouble, and I told the eye man to put her on big doses of lemonade and keep her on it, and the eyes cleared up. Of course, the whole thing is to reduce the coagulability of the blood. Finally, we must work out the relationships of this circulation.

DR. CORNELIUS G. COAKLEY, New York City: I saw a child two years of age, a robust child, with a swelling around the left orbit, exophthalmos, protrusion of the conjunctiva and swelling down on the face, with a serosanguinous discharge from the left nostril. Bacteriologic examination of nasal discharge showed streptococci; the variety, however, was not worked out. Child had an acute nephritis with a marked amount of albumin and casts—hyalin, granular and epithelial. There was also an endocarditis of sudden onset; the

abdomen was also swollen. It looked very much as though it was only a question of time before the child would die, and we all thought it best to try and open up the cheek. Following that the stools had a large quantity of bloody, purulent discharge, and of course the prognosis was extremely bad, for it looked like a general infection. A blood culture was taken and the following morning was reported upon as being very markedly positive. A blood transfusion was done from the father to the child. I expected to hear of the death of the child within three or four days, and two weeks later I heard the child was perfectly well. I think the point is most valuable in the treatment of these cases. On account of the general condition, I advised against sewing up of the orbit.

Some time previous to that, I saw a child of five years in consultation. This condition followed one of the exanthemata. That child was later operated upon.

I also saw a case last winter of cavernous sinus thrombosis, one most interesting as to the source of infection. The patient was a man who had not been feeling particularly well, and a diagnosis of carious teeth and abscess of a tooth was made. He went to the dentist with that diagnosis. This was not the diagnosis of his own dentist, but had been made by another dentist, and the diagnosis was disputed. Fortunately, the dentist who made the diagnosis had taken radiographs of the teeth and sinuses, and I was much surprised at the good radiograph he obtained of the sinuses. This was a week before I saw him. The frontal sinuses, ethmoid, sphenoid and antrum appeared perfectly normal. He showed me what he called an abscess, which may have developed a swelling around the orbit and along the eye on the opposite side from where a molar tooth of the left upper jaw had been removed. The swelling first began in the right eye. We put a hole in the antrum and drained it and a few days afterwards the opening was practically dry.

I saw the patient of whom Dr. Coffin spoke. I think we have two types of cavernous sinus thrombosis—the type that is infected, and the type that is inflammatory. If you get an infected cavernous sinus thrombosis, you are bound to have it

end fatally; but if you get one in which the organism is very mild, why there is a possibility of recovery.

DR. HANAU W. LOEB, St. Louis: I would like to make a suggestion with regard to the statement made by Dr. Coffin as to our lack of knowledge of the venous relationship. We might of course learn the names of each trunk, but I think we would find that we would not be any better off. But we do know there is a very abundant venous distribution in this region, and having that abundant venous distribution, we naturally have results of infection in the neighborhood, and that undoubtedly accounts for the majority of infective conditions in the orbit coming from the nose. However, there is such a thing as a condition resulting from mere nearness to an acute inflammatory condition. For instance, we know that acute edema results in the larynx from inflammation in the neighborhood. A year ago I reported a case before this society in which blindness had resulted from an acute ethmoiditis, and the blindness disappeared within a week after operation upon the ethmoid. At that time, too, I called attention to an observation made from studies in the neighborhood of this region, that when the posterior ethmoidal cells replace the sphenoid, the optic nerve, instead of being at a considerable distance from the ethmoid, runs along the lateral wall of the posterior ethmoid cells. This so happened in three out of thirty cases I had examined. Now, there is a further observation which I might make, that when we do have a condition of acute inflammation of the optic nerve, it is because the posterior ethmoidal cells have replaced the sphenoid, and the nerve, instead of running at some distance from the sinus, runs right along from the lateral wall.

DR. BRYAN (closing the discussion) had nothing to add.

Sore Throat Clinically Considered.

BY SAMUEL JOHNSTON, M. D.,

BALTIMORE.

In the clinical study of "sore throat" we should scan the physiognomy of the patient, mark well any changes in the voice

tones, and note the odor of the breath before entering into a more detailed examination of the case.

Among the conditions causing changes of the voice may be mentioned paralysis of the soft palate, defections in the conformation of the palatine arch, swollen tonsils, benign and malignant growth in the nasopharynx, laryngeal inflammations, paralyses, and so forth.

The odor of the breath may call attention to such conditions as uremic poisoning, pulmonary gangrene, ozena, necrosis of the nasal bones, and so forth. The need of careful inspection of the lips, gums, teeth, tongue, palate, pharynx, nasopharynx, lingual tonsils, epiglottis and larynx is emphasized.

In examining the nasopharynx an ulcer, usually of an infectious nature, is found here when least suspected, and in infectious diseases sore throat is by no means uncommon.

The writer's experience has proven that diseases of these regions differ in no way from similar pathologic changes in other parts of the body, and should receive the same therapeutic and surgical treatment.

Conservative and mild measures, however, should be the rule and guidance.

DISCUSSION.

DR. LEWIS A. COFFIN, New York City: As we grow older I think we all get to such a position where we feel that perhaps as younger men we interfered too much with the architecture of the upper air passages.

The Diagnosis and Management of Vasomotor Disturbances of the Upper Air Passages.

By J. L. GOODALE, M. D.,

BOSTON.

In a large proportion of vasomotor diseases of the upper air passages the disturbances are dependent upon the entrance of a foreign proteid into the system. The method of entrance may be through contact of the proteid in question with the mucous membranes of the respiratory or of the gastrointestinal tract, by inhalation or ingestion, respectively. Foreign proteids may perhaps also develop in or upon these mucous mem-

branes through autolysis of pathogenic or saprophytic bacteria. The application of the skin test to these conditions is of diagnostic value when employed with a recognition of the phylogenetic relationships of animals and plants as determined by studies in serobiology.

Proteid material for testing should be prepared both from the keratin and sera of domestic animals, from the pollen of the chief causes of hay fever, and from the various articles of food which enter commonly into the diet. Bacterial proteids derived from the various invaders of the respiratory tract should be available, either in solution or in the soluble form.

When the skin reactions to the various classes of proteids have been determined, the management of cases will depend largely upon the relative preponderance of the local reactions in relation to the clinical history. If the cause is found to be seasonal, as in hay fever, immunizing treatment by injection of pollen extracts is likely to prove of service. The sensitization returns during the following winter, and treatment must probably be repeated annually. If the cause is perennial and is due to inhalation of foreign proteids, it is wiser to avoid the cause rather than to seek to effect a cure by immunization. If the disturbing proteid enters into the ordinary articles of diet, a tolerance may be gradually established by feeding the substance in progressively increasing doses. Disturbances of bacterial origin have not yet been sufficiently studied to enable the formulation of a definite plan of treatment, but the results of these investigations confirm our present methods of treatment, and emphasize the importance of draining regions which can retain the products of bacterial activity. Septic foci should be removed. Vaccin therapy is likely in such anaphylactic cases to be more accurately guided than in the ordinary individual.

DISCUSSION.

DR. JOHN F. BARNHILL, Indianapolis: I would just like to ask one question with regard to whether the matter has been brought down to a working basis. For instance, if a patient comes to Dr. Goodale, what plan does he adopt for determining what the sensitization may be? Has he come to any conclusions?

DR. ROBERT LEVY, Denver: We were very much stimulated

by Dr. Goodale's work last year. I should like to ask him two questions. First, what is his mode of procedure when we have a multiplicity of sensitizations? I would like to have that more at length. And secondly, having determined for a certain individual his sensitizations to a number of proteids or inhalations (I have particular reference to inhalations), what method does he proceed with in the treatment of these individuals?

DR. HANAU W. LOEB, St. Louis: I would like to ask Dr. Goodale to tell us if lactate of calcium and calcium chlorid salts have, in his experience, had the effect of reducing the sensitization.

DR. J. L. GOODALE, Boston (closing the discussion): If I had read the whole of my paper, all of these questions would have been answered. Answering the first, as to how we proceed, I think the best plan is this: See whether the symptoms are present throughout the year, or whether they come at a definite time. If seasonal, they are probably due to something in the air; most commonly, of course, pollen. If they may occur at any time during the year, we inquire as to whether they stand in relation to colds or conditions of acute infection of the bronchial tubes. If you see the individual is entirely well throughout the summer and winter, and once in the fall or spring has a severe cold and develops asthma, we can, under those circumstances, rule out cases of foods that he takes into the stomach, and also rule out the question of animals; consequently, it is one of these other products. On the other hand, it may not be fully a seasonal infection in that it may come in November or January, or at whatever time it may be, and in that case I should proceed to investigate with special reference to bacterial proteids, and look for those organisms that we know may invade the mucous membranes of the upper air tract. Now, if the symptoms are throughout the year, without much influence from season or travel, or various modifying circumstances, I should look for asthmatic animals—especially in the case of children—cats and dogs. Children don't know cats or dogs trouble them, but they may have asthma entirely due to that. I have a recent letter from a man whose daughter had been the victim of asthma when four or five years old, who looked like a little old woman. It was really pathetic. I found it was due to nothing but the cat,

and we kept the cat away. The little child has now resumed the bloom of youth and the parents are very greatly gratified.

That is the manner in which you proceed. You bring the season, the occurrence, the incidence and mode of development of the symptoms into relation with the patients, and that simplifies it very much indeed. The use of lactate of calcium and the chlorid has made no material difference.

Angioma of the Larynx.

By EMIL MAYER, M. D.,

NEW YORK CITY.

This affection is of very rare occurrence, the writer having found only forty recorded cases in the world's literature.

He presented the history of a woman, aged fifty-two years, who had a history of previous attacks of laryngitis with hemoptysis, and who had a tumor in the larynx on the left side, extending from the left false cord and covering the true cord on that side.

The diagnosis of cancer of the larynx had been made by laryngologists who had seen her previously.

The patient was admitted to Mount Sinai Hospital, and the writer asked to report upon her condition, and remove a portion of the growth for diagnosis, if necessary.

Owing to the yielding character of the growth, its bluish tinge, and the history of previous bleeding, the diagnosis was made of angioma of the larynx by Dr. Mayer. Removal of a portion for diagnosis was deemed too dangerous, and external operation was advised. This was subsequently performed by Dr. C. A. Elsberg.

The growth was removed, the mucous membrane sutured, and the pathologist reported it to be a hemangioma.

The patient made an uneventful recovery.

The writer concludes that angioma of the larynx is a rare disease, occurring mostly in adults, the proportion of males to females being about four to one. It may be mistaken for cancer. Endolaryngeal removal, even of a portion of the growth, for diagnosis is fraught with danger, while laryngofissure is entirely safe and feasible.

DISCUSSION.

DR. HENRY L. SWAIN, New Haven: If Dr. Mayer wants another case simply to bear out what he said about the danger in these cases, I might mention one in which I attempted to remove a growth of this kind. We got hemorrhage all right. If anything further was needed to substantiate the diagnosis, the microscope did. I have a slide at home showing it to be true angioma of that type.

I am interested to hear what Dr. Lynch thinks he could do with such a case by suspension.

DR. ROBERT CLYDE LYNCH, New Orleans: I have never had an opportunity of seeing one of these cases, and have, therefore, had no personal experience with them. I think, however, that if it were possible to get underneath the place, and if the surface was not too broad and the position properly localized, it might be possible to do it under suspension. However, that could be decided at the time the case presented itself.

After seeing the illustration of the size and site of this angioma, I would not attempt its removal under suspension.

DR. EMIL MAYER, New York City (closing the discussion): I merely wish to pass around this illustration showing the shape and site of the angioma.

Further Progress in the Use of Radium in the Field of Laryngology.

BY D. BRYSON DELAVAN, M. D.,

NEW YORK CITY.

Decided advances have been made during the past year in our knowledge of the application of radium in diseases of the upper air passages, while the number of the conditions in which it is found effective is being steadily increased. Several institutions, notably the General Memorial Hospital of New York, have been fortunate in acquiring amounts of radium large enough to meet all probable demands; while those administering it are gaining experience in its use and learning how it may best be utilized and controlled.

Uses of Radium.—Closely allied to our department may be mentioned the success of radium in "vernal catarrh," or that

form of conjunctivitis which occurs during the spring, and often, when established, lasts throughout the year. Abbe has observed ten cases, recurrent for many years, and asserts that improvement always begins soon after the first treatment. Even patients who had been previously treated by the removal of hypertrophied masses, cauterization, and caustics received uniform benefit from radium and were ultimately cured.

A second interesting condition in which radium has no rival is in the reduction of lymphoid tumor cases, as found in tumors of the tongue, called hemolymphangioma.

The treatment by radium of papillomata of the larynx, as with warty growths in general in other parts of the body, is being attended with ever increasing success.

Leucoplakia of the tongue, Abbe believes, is as capable of cure by radium within the mouth as is the skin hyperkeratosis. In the mouth, however, the duration and the method of application require more judgment and skill to attain good results. The treatment is associated with transient painful irritation, but this seems essential to success. Chronic abrasions and fissures of the lip are curable by radium.

In the treatment of nevus, excellent results are being obtained.

New growths of nonmalignant type are receiving an increasing amount of attention, with excellent results. Thus, Abbe has shown a case of myeloid tumor of the lower jaw completely cured.

Tumors of the larynx of various kinds have been caused to disappear, with complete return of the singing voice.

In the field of nasopharyngeal fibroma the use of radium is most encouraging, particularly so in view of its success in the treatment of fibromata of the uterus.

Two cases observed by the writer, of sphenoid carcinoma, are worthy of notice. Both originated in the left side of the throat, close to the wall of the larynx, probably extralaryngeal. Both were seen late, long after operation would have been possible. Both patients were men in the early fifties, hitherto in perfect health, active, vigorous, and of good antecedents. When first seen, the disease in both had invaded the interior of the larynx, the left lateral wall of the pharynx, the pyriform sinus, the tonsil, and the base of the tongue. In both, ulcera-

tions were present and there was marked aphonia and dysphagia. Both were treated at the same institution, exposed to large doses of radium, and in both the results were materially the same. The first effect locally was an almost immediate control of the secretions of the throat. From having been abundant and fetid, they promptly ceased. Following this, the areas of ulceration rapidly diminished in extent, and in the less severe of the two cases disappeared, while in the other case they seemed to do so. The swellings, which had appeared over extensive areas of the affected parts, decreased markedly, and the infiltrated tissues were reduced in size, became soft to the touch, and more natural in appearance. Meanwhile the voice became clearer and deglutition improved so that both patients were able to swallow without pain and to largely increase the variety of their food. The general improvement was remarkable. Digestion became normal, and sleep more prolonged and restful. Strength increased steadily, and there was an almost normal condition of good spirits. One patient, a physician, was able to resume office practice and operative work for a period of over two months. Both have agreed that if the further progress of the disease should be entirely unfavorable, the benefit gained in the relief of suffering and the added comfort afforded would well have repaid them for any inconvenience which the radium had caused, whether from burns of the skin or from any other result.

Already results worthy of profound consideration have been obtained. Far from being discouraged, there is every reason why persistent and continued effort should be made to finally solve the existing problems and give to the world a successful cure.

DISCUSSION.

DR. CORNELIUS G. COAKLEY, New York City: The great trouble with the use of radium is that one can find little or nothing to be used as a guide in the dosage of this material. Dr. Delavan mentions in his paper "the application of a tube of strong radium for fifteen minutes." Now, that does not mean anything to those working in it. I would like to know the actual amount of that to be a guide to other men.

Another great difficulty with the use of radium is the enormous expense of the material. At the present time we are hav-

ing placed at our disposal by the Crocker Institute about one hundred grammes of radium, the cost of which is somewhere over \$10,000. We use it on various pathologic conditions. That is a prohibitive cost for most men in the practice of medicine, so they never use it.

Our greatest difficulty is that it burns, and it burns very severely. We have not yet been able to properly screen this material when placed in the mouth, or in the nose, or nasopharynx, or on the exterior of the body so as to have it reach the object of the pathologic process without getting more or less burning. If you use too little, you do not get enough action; if too much, you get terrific burns which occur not at the time; but even months later, as happened in one case treated by radium at Johns Hopkins. The patient had an application of radium a year ago last March, and the appearance of the burn did not manifest itself until August of last year. In one of my own cases in which we applied it, a portion of the nose had been burned off as a result of the action, the burn coming on six months after the application. The radium destroyed the growth of the nose, but also almost all of the nose as well. It caused external thrombus and finally destruction.

Those are some of the things with which we have to contend. We know nothing ourselves, and there is very little in the literature to guide us in escaping those factors.

There is one other point in relation to malignancy. If you use it you will unquestionably stimulate the action of the malignant process in the same way as you would if you curette or cauterize it. If you are going to use radium, you have got to get it right into the mass and have an amount which the ordinary practitioner cannot afford to invest in, so that you get enough of it to do more than merely stimulate the growth.

DR. JACOB H. HARTMAN, Baltimore: There is a case I would like to report in this connection, a most unusual experience.

In August, 1913, there was a patient, a gentleman, sent to me by his family physician with an intralaryngeal growth, of a red, angry color, filling up a large part of the larynx and interfering with the respiration. I gave him an unfavorable prognosis and advised him to have another opinion. He was

taken to Dr. Winslow for consultation, who agreed that the growth was undoubtedly malignant in character, an inoperable case. On September 4th two small portions were removed very carefully for pathologic examination. The microscopic examination was made and the specimen reported malignant. On September 14th a tracheotomy was performed. On September 21st radium was applied externally for three hours; I do not know which rays, though I believe the gamma rays—at any rate, the most penetrating. On September 24th radium was again applied for nine hours, and was followed by most extensive burns all over the neck, and the patient suffered intensely. On October 6th there was almost complete obliteration of the growth, and on October 23rd the patient was again examined and there was no vestige of the growth at all, only a slight thickening of the mucous membrane over the arytenoid space. The larynx is absolutely normal. The last time I saw him, April 12, 1916, the larynx was thoroughly clean, and there was no evidence of growth noted at all. The patient had gained thirty to forty pounds and was remarkably well and absolutely free from any trouble of this kind.

DR. HARMON SMITH, New York City: About three years ago a young boy, twelve years of age, who had a large growth, was sent to the General Memorial Hospital in New York City, where we now have some of the strongest radium in this country. At that time the application of radium only increased the growth, but we had not the strength of radium as we have at present. The boy was sent to me and had the growth removed on two different occasions with considerable hemorrhage, nearly fatal, each time. Injections of ammonium chlorid and trichloroacetic acid failed to hold it in check. The condition progressed gradually, the boy became anemic, and the growth extended out into the jaw and filled up the cheek. Some weeks ago he was sent back to the General Memorial Hospital, where they applied radium once for a period of three hours. Following that he had a hemorrhage, and a few days after the hemorrhage an edema of the larynx set up which necessitated tracheotomy, and the boy died as a consequence of it.

I recall a case of similar character where removal had not completed the disappearance of the growth and it had recurred, so this young boy, about nineteen years of age, was sent to

have his application of radium at the same time. He had an application of strong radium which set up such inflammation in the cheek and the tissues adjacent to the growth, that for a space of at least a week the boy was unable to swallow at all. We had to feed him by rectum and it became a very serious proposition. So that, in my opinion, we should know more about the action of radium before applying it indiscriminately. Yet this radium was in the hands of an expert, and applied at a hospital where radium is being used experimentally as well as practically.

I also had three cases of cancer of the larynx which required tracheotomy, and a tube of radium was inserted to be left as long as was seen fit. Those cases went on without any apparent benefit to death.

DR. JOHN R. WINSLOW, Baltimore: It was my privilege to see the case mentioned by Dr. Hartman from the beginning until the end. The last time I examined him there was no evidence of the growth, nor any indication of the site of attachment of the growth. One who had not seen the case previously would have been unable to determine whether there had ever been any pathologic condition in the larynx. Of course, the case is an absolute cure of a condition which, as far as my experience and judgment go, would have been an absolutely incurable and inoperable one.

An interesting thought occurs to me as to what happens to these growths. I took particular pains to inquire of this patient whether he had had any increased expectoration or secretion in any way pointing to a breaking down by ulceration, or similar process, and he admitted no such condition. The growth simply apparently disappears.

DR. CORNELIUS G. COAKLEY, New York City: I would like to ask, with reference to Dr. Hartman's case, whether the growth of the larynx was ulcerated, and what was the strength of radium used.

DR. JOHN R. WINSLOW, Baltimore: We are, however, greatly handicapped, for while we have practically one of the largest collections of radium in the country, it belongs to an incorporated, private institution which is conducted largely on a commercial basis. The cost of an application of radium is somewhere in the neighborhood of \$100, if not more. That,

in itself, is almost prohibitive in many cases, so that it can only be used exceptionally. There is no one who has obtained a loan of radium, and so far as I know there is no government institution for this purpose. It seems to me it is a field in which the government should take a hand and incorporate a national radium institute for the benefit of the public.

Just before I came away I saw a case of epithelioma of the nose, completely filling the nose and invading the ethmoid, as well as causing protuberance of the eyeball, in which I expect, if possible, to have the radium applied. It is a case which is absolutely inoperable. The patient is seventy-nine years of age, and the tumor myxomatous in appearance, bleeding on touch. While there has been no opportunity of removing a specimen for examination, I have no doubt but that it is an epitheliomatous growth.

Answering Dr. Coakley's question as to whether the growth in the larynx was ulcerated, and the strength of the radium used in Dr. Hartman's case, there was no ulceration and no involvement of the glands. I do not know in what strength the radium was used, but I know it was very strong.

DR. ROBERT CLYDE LYNCH, New Orleans: I have had two or three experiences with the use of radium. The first case was that of a patient with sarcoma of the nose, treated two years ago. I did the first stage of the Caldwell-Luc operation and put in the radium, unscreened—simply the little capsule with the glass container which holds the radium into the nose and antral cavity. This was a fifty-five millimeter tube. The diagnosis of sarcoma had been made by microscopic examination, and the nose had been blocked up completely. In the course of four weeks there was free nasal respiration, and an examination with the Holmes laryngoscope did not reveal any evidence of the growth at all.

The second case was one of an intrinsic laryngeal growth in which an extension occurred, necessitating something else being done. Seventy-five milligrams of radium were applied externally, fifty on the diseased side and twenty-five on the opposite side, the radium being screened with brass, then four rows of sheet lead, then the same thickness of aluminum, then gauze, and finally a rubber cot. This roll was applied to the outside of the larynx and left for twelve hours. Two days

following the application there appeared the most beautiful sunburn, the larynx was extremely red and the patient complained a little. The growth became pale, white and dry; it gave the appearance through the mirror of being dry. There was a rest of five days and then a reapplication for eight hours, accompanied by a recurrence of this burn, though not quite so much. Then there was a rest of one week and a reapplication for twelve hours. After this there was an apparent retraction of the growth. The surface remained dry and gave one the impression as if the deeper tissues of the growth, that is, the deeper invasion of the growth towards the cartilage, was becoming less. I have devised an intubation tube for the intralaryngeal application of radium. In reporting an application of radium, I think we ought to lay special stress upon the size of the dose and the length of application.

DR. HENRY L. SWAIN, New Haven: In a case exactly similar to the one cited by Dr. Winslow, in which he is expecting to use radium, we used the capsule as mentioned by Dr. Lynch. In this case we merely put the capsule into the substance of the growth, and it bled profusely for a little while. The capsule was allowed to remain in over night and the patient sent home in the morning. An external burn resulted from the application and marked recession of the growth. Dr. Winslow said he was interested to know what became of these growths. This was one of those pale, flat growths, and it became rosy hued, and all of this rose hued area eventually disappeared by mild ulceration. The whole growth was not exposed to this application of radium, so a second application was given about six weeks after the original application, at this time the radium remaining for nearly five hours. It is now only three months since the second application and the growth has practically disappeared; at least we cannot find any trace of it with a careful search. I think it is extremely valuable for us to recite our experiences in this way and discuss them from so many angles.

DR. CORNELIUS G. COAKLEY, New York City: Seventy-five milligrams of radium, when put into the growth and left there, will cause an enormous amount of destruction. Seventy-five milligrams applied on the outside of the neck for involvement of the larynx, or tonsil, or pharyngeal mucous membrane, will

not do very much. You must have an enormous amount, four hundred or one thousand milligrams, if you wish to get results from external applications through healthy tissue to malignant tissue. This must be left in about three or four hours. I think the best results are obtained by strong doses applied for a short time, and then reapplied at short intervals of about two or three days.

DR. D. BRYSON DELAVAN, New York City (closing the discussion): There are some things which belong to the laboratory. Radium does, because it requires large amounts to produce effects. The general practitioner has no more to do with radium than the driver of a hackney coach with the New York Central Railroad. It is something the general practitioner cannot, in the nature of things, know about. It is something that even Dr. Abbe, who for many years has spent such a large amount of study upon the subject, does not know enough about yet to specify. It is something which is so new and the discussion of which is so fresh that of course there is no literature to guide us. There is nothing which we can use as a guide but the work being done in a few places by a few men.

The largest amount of radium in this country is at the laboratory with which I have the honor of being slightly connected. There are two other institutions in New York doing the best work they know how to do and trying hard to learn just how to do the work—the one to which Dr. Coakley referred, and the other is one under Dr. Bissell at Johns Hopkins. Our institution will soon have two grammes of radium, and I don't know any place in Europe that has as good a supply. Radium has not yet proved a cure for cancer, but it has a possibility, and that possibility is worthy of following. Radium will burn. Well, it hurts to be operated upon in any way. It is not pleasant to take ether and be laid up for a month or two, or five months, after painful surgery, but it is a very beautiful thing to be well and among your friends. And so it is with the use of radium. Suppose it does burn? In those two cases quoted, both patients suffered severe burns, but they rejoiced at it, even though they did not result in cures, but only in temporary benefit.

If there is nothing in it, why we have tried and done our best; if there is, there is a great prize in store.

**An Epidemic of a Severe Form of Acute Infection of the Throat,
With Abscess Formation. Report of Fifty-eight Operations.**

BY CLEMENT F. THEISEN, M. D.,

ALBANY.

This epidemic occurred in Albany during December, 1915, and January and February, 1916. Cases occurred in all parts of Albany, three hundred and eighty-four coming under the writer's personal observation.

Fifty-eight of the patients developed abscesses in different parts of the fauces. Forty-four of this number were more or less typical cases of peritonsillar abscess. Of the remaining fourteen cases, in eight, abscesses developed in the lateral columns of the pharynx. There were two cases of infection of the epiglottis with great edema and some pus, two cases of abscess of the lingual tonsil, and two of retropharyngeal abscess. Joint complications, acute arthritis and polyarthritides occurred in twelve cases, acute endocarditis in one, and in twenty-four, examination of the urine showed the presence of albumin and casts. In sixty-eight cases acute otitis media, requiring incision of the tympanic membrane, developed, with one mastoid complication in a child in which the membrana tympani ruptured ten days before the writer was called.

Cultures taken during the epidemic showed streptococcus infections in the majority of the cases. A few were pneumococcus infections.

The milk supply was probably not a factor in this epidemic.

There were no deaths among the writer's cases, although some patients were seriously ill, particularly those with joint and kidney complications.

The onset of the attack in most cases was extremely severe, with chills, great prostration, swelling of the glands of the neck and high temperatures, particularly in children.

Many cases that did not go on to abscess formation, could not be differentiated clinically from follicular tonsillitis. In some there was the distinct ulcerative type of acute tonsillar infection, and these cases were very ill. In a small number of cases a distinct exudate covered the tonsil, but none of these cases proved to be diphtheria. Great edema and intense acute

angina were characteristic of many of the cases. The laryngeal mucosa was involved in the edematous process in a small number.

DISCUSSION.

DR. HENRY L. SWAIN, New Haven: I feel that I must say that Dr. Theisen did not lose a single case of his four hundred cases.

DR. CLEMENT F. THEISEN, Albany (closing the discussion): I would like to mention that the epidemic in Albany and the adjacent city was not due to milk. We studied all the epidemics with that point in mind, and proved that fact conclusively. There have been epidemics of sore throat caused by infected milk, but in the epidemic in Albany this could be ruled out, for the cases were distributed in all parts of the city, and there were just as many supplied by one dairy as by another.

A Résumé of My Year's Work With Suspension Laryngoscopy.

BY ROBERT CLYDE LYNCH, M. D.,

NEW ORLEANS.

To prevent fracture of the alveolus the writer places a strap under the occiput and clamps it into the angles of the pear-shaped ring, thus relieving the pressure of the tooth plates against the teeth.

In order to prevent other tooth injuries, the writer uses dental impression spoons filled with moulding compound which offers complete protection to the teeth, facilitates the introduction of the spatula, and makes it easier to keep the spatula in the middle line.

He also described the table which can be raised twenty inches, the top can be tilted and can be moved in a circle. There are foot and shoulder braces.

Regarding intrinsic epithelioma of the larynx, the writer's experience has been exceptionally good with endolaryngeal removal, but feels that his experience is not large enough to reach definite conclusions.

Dissection under suspension is not difficult, and can be done without permitting an instrument to touch the tumor mass.

Nineteen cases of papilloma have been successfully operated, dissecting well below the base, curetting and painting with alcohol.

Pedunculated fibroma, vocal nodules, a cyst of the aryteno-epiglottic fold, pachydermic laryngitis, perichondritis of the thyroid, fracture of the thyroid cartilage, tubercular laryngitis, abscess of the epiglottis, and foreign bodies in the trachea and esophagus were all cared for by means of the suspension apparatus.

DISCUSSION.

DR. EMIL MAYER, New York City: There is one phase of suspension that has not been mentioned by the writer of the paper, which has worked splendidly in my hands, and that is in the treatment of stenosis of the larynx and trachea. In one instance, that of a little boy who was on my service at the Mt. Sinai Hospital, and who had tracheal stenosis, postoperative, it became necessary to intubate, and the only way possible was under general anesthesia. It was my hope that we could keep the trachea widely open with the wearing of the intubation tube. With the capable assistance of my associate, Dr. Yankauer, this boy has been anesthetized, and we intubated a number of times. He has been wearing the intubation tube for a matter of two years now, and we are in hopes that he will be able to do away with it eventually by the interesting method of transplanting fascia in cicatricial tissue. In this case I do not know what I would have done without being able to put the child under general anesthesia and use the suspension apparatus; first of all, to distend the web of cicatricial tissue, and then to intubate.

The second case was that of a man with syphilitic stenosis of the larynx. It became necessary to do a tracheotomy on account of the stenosis. He then received regularly, about three times a week, a distension of his larynx by means of Schrolter's tubes of increasing diameters, so that by the time he was ready for the intubation tube, his larynx was fairly well distended. He also received some salvarsan injections. I felt that we were able to do something for him in a good deal quicker time than ever before in my experience. The man was given a hypodermic of morphin and told what we wanted

to do, and without any general anesthesia whatever we put in the intubation tube. This remained in situ, and about ten days afterwards he coughed out the tube. The amount of breathing room was so much greater directly after this, that we were willing to do without the intubation tube. In this exceedingly short space of time, by this means and the treatment of salvarsan and mercurial injections, he has been quite cured. The suspension apparatus helped us materially in this case.

DR. JOHN F. BARNHILL, Indianapolis: I would be glad if Dr. Lynch would tell us about his present views of anesthesia with the apparatus.

DR. ROBERT LEVY, Denver: In the treatment of tuberculosis of the larynx I have been particularly pleased with its value in removal of the epiglottis; the special feature in its favor here is that one has perfect control of the hemorrhage following the excision of the epiglottis. Before the advent of the suspension apparatus, in an attempt to remove the epiglottis, I had rather serious hemorrhage upon two occasions. In several cases of epiglottectomy since the suspension work has been in vogue, hemorrhage has had no terrors whatever for me. I have seen an artery spurt from both sides of the stump, of sufficient size that it could be seen by a class of students at some distance from the operation. The artery spurts into the mouth, and one controls the hemorrhage with the greatest ease by means of artery forceps.

In curettage or cauterization of the larynx for tuberculosis the apparatus is of great value because you can do so much more in one sitting than by the direct method.

With these cases it has been my practice to use scopolamin and morphin, although in one case I had a death on the table, which I attributed to the highly unstandardized preparation of scopolamin.

Tumors of the larynx have been exceptionally easy of removal with this method. This fairly sized malignant tumor was removed by suspension. It sprang from the posterior wall of the larynx and came over by its attachment on the external surface, so that it was partially extrinsic. It was placed in such a position that when the patient sat erect it flopped into the larynx and produced dyspnea. On two occasions the patient was picked up on the street and sent to the hospital, so

that any prolonged operation by direct method would have been impossible, but by suspension it was removed with the greatest ease.

In the dissection of a venous cyst with large veins that bled freely in the hypopharynx the method was particularly valuable, because I could make a very wide dissection. This case was one in which removal had been attempted on several occasions without success. I made two attempts, a cautery had been used several times, and one consultant injected it with iodine. It recurred always until we were able to make a wide opening under suspension.

DR. HARRIS P. MOSHER, Boston: When Dr. Lynch began his work, especially the work of removing malignant disease of the larynx, I withheld my judgment for a time, waiting to see what his results would be. In the paper read this morning I was very pleased to see that he had gone on carefully with a great deal of judgment, and that he had come to the conclusion which many of us felt that he would come to—that is, that the removal of malignant disease by suspension was not a final success, but that thyrotomy was better. For myself, I feel that I much prefer thyrotomy to suspension removal of malignant disease.

DR. ROBERT CLYDE LYNCH, New Orleans (closing the discussion): The chief essential of the suspension apparatus is to obtain relaxation of the parts. Whether the anesthetic be morphine and scopolamine or another, is left to the individual judgment of the case. I have used only cocaine anesthesia, and prefer it. I give one or two doses of morphine, one-fourth grain one or one and a half hours before the operation, and one-eighth grain one-half hour before the operation is to be done. For surgical work I much prefer general anesthesia in those cases where it is not definitely contraindicated. Under general anesthesia we get the proper amount of relaxation of the parts, and are able then to suspend the patient until we get the proper view. You must understand, suspension is not an easy proposition so far as the patient is concerned. It is not painless, and for that reason patients must be put in such shape that will not interfere with the work after it has been once started.

Pathogenesis of the Nasal Neuroses.

BY CHARLES P. GRAYSON, M. D.,

PHILADELPHIA.

The subject is reintroduced because of the fact that during the past few years some very important additions have been made to our knowledge of the causes and consequences of certain disturbances of metabolism, the effects of which should arouse particular interest because of their bearing upon the genesis of the nasal neuroses, being those that are exerted upon the cerebrospinal and sympathetic nervous systems. Reference is intended only to the vaso- and secretomotor neuroses of the nose, and not to the functional disorders of the olfactory nerve, nor the neuralgias of intranasal or accessory sinus origin. The treatment of these affections has not been rational, in the sense of having been directed against their cause rather than their effects. It has been too largely local. Loss of vasomotor equilibrium is almost invariably due to a greater or less degree of nervous exhaustion. Anaphylactic reaction may explain a moderate number of cases. The basic condition of almost all of these patients is one of neurasthenia due to metabolic derangement occasioned by persistent violation of the laws of personal hygiene. The studies of Abderhalden, Fanser, Kafka, and others, of the physics and chemistry of the colloids and of the effects of ferments, toxins and hormones upon the sympathetic nervous system have a close relation to the etiology of the nasal neuroses. No strict pathogenic analogy exists between these diseases and the angioneuroses of the nose, but it requires no great stretch of the imagination to discern a possible or even probable relationship between the metabolic processes concerned in each. It is almost a certainty that in dealing with the nasal neuroses we are dealing with phenomena that are the outcome of some perversion of metabolism. Its exact nature may vary in different cases, involving at times some glandular disfunction, at others toxemias of intestinal origin, and at still others the presence in the blood plasma of certain ferments or hormones, but in all cases the symptomatic result is due to the same intermediate cause—a toxic action which expresses itself through the sympathetic or autonomic nervous system. To be successful in suppressing

the neurotic type of nasal disorder, we must abandon our fruitless search for specific remedies and apply ourselves to the hygienic instruction of our patients and to the development of an internal treatment founded upon a recognition of the essential nature of the disease.

DISCUSSION.

DR. GREENFIELD SLUDER, St. Louis: The entire text of Dr. Grayson's paper is so at variance with the work I have done, beginning in 1909, that I feel impelled to recall some of the things that are within this discussion. I realized then, and I do now, that there are many elements, all of which Dr. Grayson had cited, which must be considered. Patients are sometimes highly neurotic and neurasthenic, and all of the various features he has mentioned are there, but if you can trace some of these patients back to the beginning, you will find that up to a certain time they were in good health and supposed to be normal; that they began with a violent coryza, with a terrific headache, and in the wake of that followed the pain in their neck, chest, etc., conceived by the neurologist as pathognomonic of neurasthenia. The pain in their necks and stiff necks was transferred to a "dislocated vertebra," and for twenty years they were spoken of as neurasthenic. Watching these cases from time to time, it has been my opportunity to make out that preceding these symptoms was a sphenoidal postempyema, and in the wake of that remained a subacute inflammation, sometimes localized sharply to the sphenoid palatin formation or the membrane which overlies the nasal ganglion. The membrane overlying the nasal ganglion is a sharply inflamed patch of redness, clear as one of the lamps on the wall, and an application of cocain to that particular point will relieve all the symptoms—the pain in the neck will vanish, the eyes become normal, etc.

It seems very difficult to work out that such a case in an able-bodied normal man, hard worked and responsible in life in every way, should point to the fact that that individual had suddenly become neurotic.

I shall not say anything more about it other than that my observations are in direct diametric variance with those of Dr. Grayson.

DR. BURT R. SHURLY, Detroit: It seems to me that we all

err in taking care of this class of cases because of the fact that we do not classify them where they properly belong. In my opinion these cases should at least come under three large classifications: (1) Those cases which are sensitized to some particular condition, a food sensitization perhaps; (2) a so-called pollen sensitization; (3) a sensitization to some other chemic phenomenon.

We are just beginning to understand a few of the phenomena which may give rise to these devious motor disturbances. When we carry this subject deeper and farther, I think that these three classifications will include those cases which Dr. Sluder has mentioned, where we have termination in a purely localized condition; again, where we have a sensitization; and still again, where we have what has been so beautifully demonstrated in the laboratory with the carrier pigeon—a condition of early nerve fatigue in the granules in the giant cells of the spinal cord. You can take a carrier pigeon that has been on a long flight and examine histologically the giant cells of the spinal cord and find it completely changed from the picture of another pigeon's cells histologically. The granules in the first pigeon are absolutely used up, and the whole problem of nerve fatigue following that long flight of the carrier pigeon can be absolutely seen under the microscope. It is very remarkable—the change which the nerve cells adopt.

It would, therefore, seem very easy for that class of neurasthenics whose vasomotor function is less under hereditary disability, to have nerve fatigue develop under the slightest exercise. It seems to me that we must be very much broader in our consideration of this subject.

DR. GEORGE A. LELAND, Boston: It had seemed to me for a long time that we have an autointoxication in these cases. Why are some patients so highly susceptible to nascent proteins? Is it not because they are so hypersensitive to all proteins? That means that we are overfed in a nitrogenous way. If a patient is highly sensitized to nitrogen, if he has autointoxication from hyperacidity of his blood, shown by the hyperacidity of the urine, then it is reasonable to suppose that a nascent proteid in its most terrible state coming from a germ of pollen should set up these nasal neuroses. I do not consider it altogether a case of neurasthenia, but the "last straw

breaks the camel's back." The patient is hypersensitized and therefore affected by these proteids.

He cited a case of a fashionable young lady, about thirty years of age, who came into his office one day, very indignant because she had been treated for a long time in various ways without obtaining any relief. So he asked about her general condition, and in the course of the questioning it developed that previous to four years before she saw him, she had been a stenographer, living very simply in a cheap boarding house and taking a normal amount of exercise each day. For the past four years she had been married to a wealthy man, and since that time had been living at a very fashionable hotel in Boston, eating heavy and rich foods, drinking regularly, and not exercising at all. When she had finished the story I told her, "Back to the simple life for yours!" and put her on a proper diet, and in less than three months she had no more hay fever and has had no more since.

DR. LEWIS A. COFFIN, New York City: I have had some satisfaction in my treatment of this class of cases, which has been direct general treatment of the patient, particularly in regard to diet, elimination and cleaning up of the bowel.

DR. J. SOLIS COHEN, Philadelphia: It has given me great pleasure to hear the paper under discussion, because it confirms the opinion I expressed more than a generation ago in one word—"coddling."

DR. JOSEPH L. GOODALE, Boston: There is undoubtedly a psychic effect in some forms of this condition. We know that the outbreak of hay fever in certain cases frequently occurs on exactly the same day every year, notwithstanding the great seasonal variations and the fact that the pollen does not appear always on the first of August. There are certain cases in which the hay fever appears on the first of August regularly, and that is the result, it seems to me, of a psychic expectancy. The man who went into the barn to set the broken leg of his friend was not thinking about his hay fever, and that is another reason why it probably did not develop. His psychism was not fixed upon the fact that he might develop hay fever.

DR. CHARLES P. GRAYSON, Philadelphia (closing the discussion): I did not intend to teach anything new in this paper. My only intention was to refer to and emphasize certain facts

of comparatively recent discovery or elaboration. I think Dr. Shurly's classification of these different cases is a thing we ought to be particularly cognizant of in every new case we examine.

There is no question of the occurrence and existence of cases such as those referred to by Dr. Sluder, but they are in a class by themselves. If he means to imply that it is a very large and extensive class, I have my doubts. Of course, there are a great many in the aggregate, but the proportion to all others is, I think, comparatively small.

The Relations of the Sphenoid Sinus to the Eustachian Tube, and Their Possible Clinical Importance.

BY GREENFIELD SLUDER, M. D.,

ST. LOUIS.

When the sphenoid cell is prolonged downward into the pterygoid process it approaches the eustachian tube more or less, and it may come to such close association as to be separated by an egg shell thickness of the bone. This comes through two factors: first, the thickness of the bone of the pterygoid process is absent, and second, the origin of the tensor palati is not from the uppermost limit of the plate. Should the tensor palati arise high on the plate, the thickness of the muscle will enter in between the tube and the bone of the sinus wall. Should, however, the tensor extend a lesser distance upward on the plate, the tube comes into close relation and in some specimens is in contact with the egg shell thick wall of the sinus.

The Relations of the Sphenoid Sinus to the Semilunar (Gasserian) Ganglion, and Their Possible Clinical Importance.

BY GREENFIELD SLUDER, M. D.,

ST. LOUIS.

The semilunar ganglion is at present thought of as so far removed from the sphenoidal sinus that they have not been associated in the minds of the anatomists or clinicians. The internal carotid artery usually rises on the lateral aspect of the body of the sphenoid, and the semilunar ganglion is usually

lateral and posterior to the ascending artery. This, however, is not always true. The position of the artery seems to have a large part in determining these relations.

I present drawings of two specimens showing an intimate association of the sphenoid sinus to the semilunar ganglion, or parts of it. Figure 1 shows dissection of the cavernous sinus, semilunar ganglion and sphenoidal fissure, viewed from above. The sphenoid sinus lying beneath these structures is shown in dotted line. The thickness of bone separating the cavity of the sphenoid from these structures was egg shell thin. The internal two-thirds of the ganglion are exposed to the uppermost part of the sphenoid cell, and the external third is exposed at a little greater depth as the nerve tissues approach the foramen rotundum. The mandibular nerve in the foramen rotundum is exposed for ten millimeters to an egg shell bone separation from the sphenoid cell.

In the sphenoidal fissure the oculomotor, abducens and ophthalmic are exposed to an egg shell separation from the sphenoid cell. The trochlearis alone is not in this contact, because it lies on top of the oculomotor.

In 1912 I proved the permeability of the sphenoid sinus wall to a small amount of cocain. Following this observation, with its lesson, into these anatomic associations seems to me to offer an explanation of the herpes which develop in the wake of sphenoidal infections, or the "cold sores" which arise in some patients from ordinary coryzas, irritation of the sensory ganglion cells being necessary for the development of herpes, and to explain why semilunar ganglion neuralgias and tic douloureux of sphenoidal origin sometimes recover as a more or less acute or subacute lesion, and at other times requires a ganglion removal or a posterior root section—i. e., sometimes the sphenoid lesion can be controlled, and at other times it cannot.

A Surgical Consideration of the Upper Paranasal Cells.

BY GREENFIELD SLUDER, M. D.,

ST. LOUIS.

The procedure I describe has been satisfactory in my hands for ten years. It may be limited for the frontal sinus, providing a very high cut of the middle turbinate, which I have fre-

quently mentioned in various texts as a "cribriform or infundibular turbinectomy." The cut is actually two or two and one-half millimeters from the cribriform plate, and may be extended to the most anterior limit of the infundibulum.

This very high cut may be carried backward to include the capsule of the ethmoid, under which condition not only is the middle turbinate removed, but the uppermost line, and usually all the other ethmoidal cells are opened wide into the nasal cavity. And when desirable the entire anterior wall of the body of the sphenoid from its uppermost limits, with all its postethmoidal association and much of its floor, may be removed. In my judgment and experience it is the technic that most often may be trusted to open all of the cells, regardless of unusual or anomalous positions. I know, however, that cells may exist that not only cannot be opened from the nose, but cannot be located by any means at present at our command. They can only be recognized in the cadaver, and then only by complete dissection. Everyone who has observed a reasonable number of specimens has seen such cells and been struck by the futility that would attend any surgical effort to reach them; and everyone of reasonably wide experience has met cases where all efforts had failed to find and treat such cells. But there are many other cells that are placed in positions more or less unusual that will be opened by a technic which has for its primary plan an incision which will skirt the cribriform plate and remove the middle turbinate at its most anterior as well as its most upper limits, and extend into the sphenoid body at its uppermost part, regardless of the natural opening, and then be extended downward until it has cut through its floor or found it to be impenetrable. I have here avoided the designation of sphenoid sinus, because such a term does not always comprehend the full body of the sphenoid. It (the body) may be subdivided, and shared by a postethmoidal cell. And it is this variation which I believe to be the most pernicious from the clinical side (for headache and optic nerve lesions), as well as anatomically far more frequent than is at present recognized clinically. This variation will, it seems to me, be satisfactorily dealt with by this proposed technic practically every time it is met. Also prefrontal ethmoidal cells will be opened into the nose as a rule, if not uniformly.

In 1907 I published an elementary text in which I described a surgical method which was at that time novel. It consisted in approaching the turbinate from above on its inner side. Prior to that all surgical approach was from below laterally upward, removing it by scissors or snare, or a combination of these or such working instruments. I described a knife consisting of a handle, a shaft and a cutting end turned at a right angle to the shaft and sharpened so as to cut on the inside of the right angle—i. e., on the pull. It was also sharpened on a face parallel to the shaft, which at the same time gave it far more strength than a hook could have were it sharpened on its concavity. I selected this shape in preference to a hook for those reasons, and the fact that great strength is necessary for the tasks to which this knife is put. The knife, although possessing great strength, is so small that it may readily enter spaces which larger instruments could not. I believe it to be the smallest nasal instrument possessing great strength.

The intranasal surgery of the upper cells may be performed by this method in any part or the whole as conservatively or as radically as desired. The ability to place the incision safely two millimeters below the cribriform plate in any part of or in the whole length of its extent seems to me to be the most advantageous, and not a small part of this advantage is the power to extend this incision to the foremost limit of the infundibulum, thereby opening the inlet of the frontal to its widest natural possibilities. It is most desirable to preserve the natural inlet here, and this is done by a cribriform turbinectomy which leaves undisturbed the histologic epithelial covering of the normal inlet—i. e., the uncinate process, the bulla ethmoidalis, the hiatus semilunaris and infundibulum—regardless of the anatomic variations of the frontal inlet. Should these parts be wounded, as in a curettement, the resultant scar tissue blocks the inlet. The angle knife removes by cutting any desired tissue with the least possible trauma to the surroundings. In the sphenoidal district it opens the uppermost and lowermost possible parts of the face, which has the advantage sometimes of opening also a postethmoidal cell which may occupy part of the body of the sphenoid. (Such a cell is often the cause of the entire clinical picture.) The angle knife is so small that it takes up the minimum room, and

so leaves the small field open to the best vision possible. Its execution is always in the direction away from the danger zone. I have so far not seen such satisfactory postethmoidal surgery by other methods. (This district seems to me the most dangerous of all, for on the outer upper aspect runs the optic chiasm and cranial cavity.) Satisfactory execution is necessary, particularly in eye lesions.

This entire performance may be accomplished within a short time. I have often finished the high frontal ethmoidal and sphenoidal combined operation in two minutes (including the postorbital opening on one occasion).

A septum nasi deflected into the affected side may add troubles for the surgeon. I have in such cases where the middle turbinate was not visible from in front in any part, used a bivalve speculum specially constructed for the purpose. Just as Killian elongated the blades of the primary bivalve for his needs in septum resection, I have elongated them still more and widened them for my needs here. The speculum should be made of tempered steel blades, knife-like thin, with handles long enough to give leverage to dislocate the entire septum into the opposite nostril. It should have a set screw, for the pressure required is much, and the hand gets tired holding it. Its blades should be nine millimeters wide, for narrower ones, such as are supplied with Killian's, often do not give sufficient view. They should be eighty-eight centimeters long, for shorter ones (Killian's) sometimes fail to reach the posterior field of operation.

The knives are also made right and left. Some of my associates prefer these. My own preference is for the single, straight, original model. I recommend an extra two and one-half centimeters long shaft for use with the long blade sphenoidal speculum. A strong, large handle ought always be supplied for the knife.

A right-hand surgeon makes his turbinate cuts for the left side with cutting edges in the plane of the handle. For the right side the cutting edges are turned one-quarter (ninety degrees) into right nostril. This makes them horizontal or transverse when the handle is on the middle line.

DISCUSSION.

DR. HARRIS P. MOSHER, Boston: I feel that in working on the ethmoid the questions of time and an accurate knowledge of the anatomy, with a simplification of all procedures are essentials. If you can come down to two minutes, it is about as simple as you can make any procedure on the ethmoid. With Dr. Sluder I think two minutes would be a long time for him in which to do the operation. Again, the fewer instruments you can get along with, the better you are off. I have never done much with Dr. Sluder's knife, but I have spoken to a number of men who have used it and liked it. I believe that for work on the ethmoid we ought to come down to two or three instruments—instruments which are large enough to see and easy to follow from the beginning of their use. For instance, I use a simple straight curette, and the other ordinary instruments.

My feeling is that simplification of the procedure, simple instruments, and an accurate knowledge of the anatomy are essentials in dealing with the ethmoid. Anything which helps that along is welcome; anything which adds to the complexity of the instruments adds to the difficulties.

DR. J. WINSLOW, Baltimore: I find the Sluder knife of the greatest use in practically all nasal sinuses, and employ practically no other instruments in work on the middle turbinate, unless it be a pair of tiny forceps or snare. One reason that attracted me to the instruments in the beginning was that I had a number of cases with suppuration and deviation of the septum, and it was extremely desirable that there should be good drainage. At that time I did not feel it proper to perform the deviated septum operation, and required some instrument small enough to correct the condition. These knives served the purpose.

DR. CHRISTIAN R. HOLMES, Cincinnati: I want to congratulate Dr. Sluder upon his most excellent paper. I think, however, that it is well enough for us to bear in mind that we are in a most dangerous region, and what can be done by Dr. Sluder, an expert, cannot be done safely by inexperienced hands. We are in a region where we operate because there is infection, as a rule.

I have in mind a case where I wanted to do a Killian, clean-

ing out all the cavities. It really was a case of ozena, but I attributed it to disease of the sinuses and wanted to remove the middle turbinate before proceeding with the general operation, both for the purpose of testing the condition, and seeing whether there was a tendency to active suppuration, etc. The removal was very carefully done, under all precautions, and in spite of that the patient developed meningitis and died. And here the middle turbinate was removed by scissors only, so there was no special trauma.

I am not in any way decrying the method as presented, but am simply calling attention to the fact that we send out these articles without a word of warning to the inexperienced men who read them and learn about these instruments without ever having had an opportunity of using them. This is very dangerous, and I think we are not doing our full duty. It seems to me that Dr. Sluder has not sufficiently emphasized the fact that there is danger, unless we use special care, and that inexperienced men, who do not know the anatomy or bacteriology, cannot consider that they can buy the instrument without knowing how to use it, and then begin to work around the cribriform plate.

DR. GREENFIELD SLUDER, St. Louis (closing the discussion): Had I adhered to my text, Dr. Holmes would have been answered. It is emphasized that the district must be approached with care and understanding.

I fancy that Dr. Mosher's idea of the simplification of instruments is not quite right, from the number that I have turned in to the chair. There is one knife which may be used for the entire procedure, if you stop to turn it this way and that. If you want to work faster, you can have three knives turning in various directions. Others are unnecessary except for more or less refinement in technic.

I think, however, that the only reason I have for appearing before you today with this technic is that it affords a method which cuts everything downward and outward. If there is any device which can make surgery at or approximating the cribriform place safe, it is in our hands, and it seems to me that whosoever will approach the district with this method shall have a means which will let him get his bearings, feel the cribriform plate, and then begin his cut. If the knife is big

enough, it can tear into the orbit, and that is the reason I have emphasized the necessity of the surgeon knowing his model.

I am glad Dr. Holmes emphasized the necessity of care being taken and emphasis being laid upon who shall and who shall not work in this region. I am perfectly aware and alive to the fact that there are many surgeons who buy instruments from the instrument maker and do not familiarize themselves either with the method which requires the instrument or even the directions accompanying the instrument. There is no help for that; we cannot appeal to such a man nor emphasize the necessity of his knowing just what he is doing. He must know his anatomy, first, last and forever; and secondly, he must have an instrument which will then make his procedure as safe as the procedure may be made.

The Tonsilloscope and the Exploration of the Interior of the Tonsils in Situ.

By THOMAS R. FRENCH, M. D.,

BROOKLYN.

The speaker has devised a method by which the external tonsilloscope, originally intended and used for the examinations of exploratory sections removed from the tonsil at the beginning of operations, and now used for study of the tonsil, as a whole or in part, after operations, may be used for direct tonsilloscopy or for the examination of the tonsil in situ. The introduction of the instrument into the throat is accomplished by using the shortest of the Jackson bronchoscopes with a beveled end and a lamp on a light carrier of the next largest tube, packed securely with gauze so that the lamp is held just within the distal opening and the end of the tube slipped behind the tonsil. In this way the tonsil is lighted up as brilliantly as in the powerful external apparatus. With this instrument the writer has studied the various classes of tonsillar disease, including three hundred and thirty-three cases that were operated upon, and a large but indefinite number of youths and adults. He concludes that while this may not permit definite and final deductions, nevertheless the results seem to indicate that the erstwhile enlarged tonsils of health in childhood may be regarded as permanently diseased if they continue enlarged

after the seventh or eighth year, and that the enlarged tonsils of health which undergo a retrograde metamorphosis in late childhood may remain the tonsils of health throughout life. The assumption that the tonsil has no special function because it has not yet been discovered, is an unconscious confession of impotence to which few could agree, but one conclusion reached in this study is that the function of the tonsil is a negligible feature, for it must be conceded that a tonsil which is extensively diseased would probably be the potential or actual source of too much mischief to be offset by the value of any function which a part of it might possess. When, however, a tonsil is found to be that of health, it should be left at least in part to perform whatever function it may have, and also incidentally to spare the fauces the now common postoperative deformities and the consequent impairment of the speaking and singing voices.

DISCUSSION.

DR. D. BRYSON DELAVAN, New York City: This work is very real in its simplicity and its practicability, and very real in the ease in which it can be applied; there is nothing in it which would not come within the technic skill of any ordinary operator. It is all that you think it to be from the short presentation of it, and a great deal more besides.

DR. E. FLETCHER INGALS, Chicago: I would just like to ask Dr. French how large a tonsil must be before he calls it "enlarged."

DR. HENRY L. SWAIN, New Haven: When I wrote a paper some time ago in defense of the much slaughtered tonsil, my whole thought was that we ought to be able to tell in young children, under age, whether a tonsil was diseased or not. I want to congratulate Dr. French, for I think it is a very wonderful thing.

DR. CHEVALIER JACKSON, Pittsburgh: Long ago I gave up the tonsil as a "bad job"—one not for me to do. It requires more skill than I could bring to bear upon the subject. I have, however, a distinct recollection of talking various cases over with members of this society, and I find that there is a very fluctuating idea as to what constitutes a diseased tonsil, apart from mere enlargement. It seems to me that we are arriving at

a stage of accurate diagnosis when we study the tonsil in this way.

DR. JOHN F. BARNHILL, Indianapolis: On two occasions last year I remember tonsil patients were brought to my observation, and in neither case could I find any trouble. I was frank to say so, and stated I did not think the tonsils should be removed. In each instance the family physician said: "There is some condition here which I am confident has arisen in the tonsil," and upon that statement and his recommendation, I was willing to do the work. In each case I found a cold abscess outside of the capsule.

I am wondering if Dr. French's method would have been able to discern this. In each instance the abscess had been present for at least a year.

DR. HANAU W. LOEB, St. Louis: There are two points I would like to know: If the instruments can be procured, and where; and secondly, whether or not the method will demonstrate the presence of the minute multiple foci of pus in various portions of the tonsil.

DR. GREENFIELD SLUDER, St. Louis: These are the observations for which Dr. French's friends have been waiting so impatiently. I have known of what he was trying to do and something of how far he was succeeding.

DR. THOMAS R. FRENCH, Brooklyn (closing the discussion): In answer to Dr. Ingal's question as to the definition of the word "enlarged," that was covered in the part of the paper not read. I tried to make it clear that I referred and do refer in such tonsils to glands which project beyond the edges of the anterior pillars, or sufficiently large to curve the anterior pillar forwards.

In answer to Dr. Loeb, I don't know who makes the instruments; these were made for me by Hardy, at Twenty-second street, New York, and I presume he would make them if wanted.

Without Dr. Sluder's assistance and his brilliant technic in the first stage of the experiments, I do not think this thing could have been accomplished. Without the first stage there would not have been any second or final stage, and I am under great obligations to Dr. Sluder for that work.

As to the ease of finding, perhaps a moment might be well

spent in listening to the description of a patient who came under my care about six weeks ago, and was under my care for two weeks. She came to me for labyrinthine deafness on one side. For eighteen months previous to the time I saw her, her hearing had been absolutely blank and responded to nothing. The patient was a school teacher, and a very intelligent lady. She had read Dr. Shambaugh's article on infection, in which he suggests rather than justifies the infection. I examined her and found she had a tonsil which would have made a hypertrophied tonsil. Yet with this method I saw four different collections in that tonsil, and on the basis of that, and with continual reference to the article as to the thing I was doing, took out one; at the end of the second week I got out the fourth one, and she came in the following day with her face like the sky in the morning. Her hearing had entirely returned and absolutely responded to every test as completely normal. It was very easy to find those; with the aid of a lamp I got out the fourth one. Yet her tonsil is still hypertrophic, and along with these areas there is a mild general hyperemia which indicates the presence of at least a possible irritating substance. It really was one of the most startling cases, and indicates what must of necessity come to us at times.

**Endothelioma of the Right Bronchus Removed by Peroral
Bronchoscopy.**

BY CHEVALIER JACKSON, M. D.,

PITTSBURGH.

A man of thirty-five years had complained of wheezing, cough and mucopurulent expectoration of five years' duration. For two years he had been treated for tuberculosis, though bacilli had never been found in the sputum. Diagnosis of various clinicians had been: tuberculosis, chronic right-sided bronchitis, monolateral (right asthma). Dr. J. C. DaCosta had made a correct diagnosis of stenosis of the right bronchus. Radiograph showed dense shadow of lower right lobe, and in consultation diagnostic bronchoscopy was urged.

Dr. Jackson found and removed bronchoscopically a pedunculated tumor which had made for itself a dilatation in the right bronchus. Patient entirely recovered in two weeks, expectoration disappeared completely at the end of four weeks.

At the end of ten months patient had gained twenty-six pounds in weight and was perfectly well. The pathologist reported the growth to be an endothelioma. The author makes the following conclusions:

1. Diagnostic bronchoscopy is indicated in cases of monolateral "asthma," bronchitis, bronchial obstruction, and in cases of tuberculosis where persistent search fails to show tubercle bacilli.

2. Peroral bronchoscopic removal of an endobronchial tumor is feasible under local anesthesia.

3. General anesthesia might have permitted the clotting of blood in the lower bronchi before expulsion, involving septic risk.

4. Peroral bronchoscopic removal may be justifiable in a malignant endobronchial growth if small, circumscribed and not ulcerated.

5. As this is the only recorded case of apparent cure of an endothelial endobronchial tumor by peroral bronchoscopy, and only the second endoscopic removal of any form of malignant growth from a bronchus, it would be unwise to make too many or too sweeping deductions.

Report of the Removal of a Fragment of a Tracheotomy Tube From the Lung, Six Years After Its Inspiration.

By FRANCIS R. PACKARD, M. D.,

PHILADELPHIA.

An Italian, thirty-three years old. Twelve years previous to present complaint had typhoid fever, necessitating intubation. On removal of the intubation tube had tracheotomy performed, and has worn the tracheotomy tube ever since. The past six years had suffered from violent attacks of coughing, accompanied by expectoration of blood and much pain in his chest. An X-ray examination revealed a foreign body lodged in the right bronchus opposite the left intercostal space. The patient was etherized and the foreign body removed by means of the Jackson bronchoscope. The symptoms cleared up and the patient refused to allow the tracheotomy wound to be closed, although it seems as though this might have been done and his proper method of breathing restored to him.

DISCUSSION.

DR. J. SOLIS COHEN, Philadelphia: A great many of the tracheotomy patients keep their tubes in without taking them out for cleansing, and in the course of time they become more or less detached. I have tried to prevent this by having my tubes made without the solder. I then adopted the plan which I have recorded in my reports of always insisting upon a patient having two sets of tubes, and changing them on alternating days. In that way you will avoid any instance of this kind. The patient can take it out and cleanse it and put a new fresh tube in.

**A Case of Vagotonia, Apparently Originating in the Nasal
Accessory Sinuses.**

BY GEORGE FETTEROLF, M. D.,

PHILADELPHIA.

Vagotonia can be defined briefly as a condition of excitement or high tonus of a group of nerves called the "extended vagus." The phrase "extended vagus" is applied to a nerve series which includes not only the pneumogastric, but also a group of nerves which functionate similarly to it. Antagonistic to the vagus group is the sympathetic, and there exists a condition of it called sympatheticonia, which can be defined as a state of excitement of high tonus of the sympathetic system. In order to locate accurately the "extended vagus" and sympathetic systems, the writer reviews briefly some points in the anatomy of the nervous system.

In action the two groups, the autonomic and the sympathetic, are antagonistic, and it is generally conceded that all glands which possess ducts and all involuntary musculature receive a supply from both. Upon the maintenance of a proper balance between the two depends the normal functioning of the structures to which they go. If the autonomic supply is irritable, the organ will overfunctionate in one direction, and if the sympathetic is in a condition of hypertonus or excitement, the excess of action will be in the other.

As glands and muscles are the organs to which these impulses go, the result will be manifested by hyper- or hypo-

secretion on the one hand, or by spasm or relaxation on the other.

The control of the entire vegetative system, both autonomic and sympathetic, is believed to lie in the cerebrospinal axis, where possibly a regulating center exists, and in the glands of internal secretion, the so-called endocrinous glands. This latter is quite well established for the sympathetic system, adrenin having been shown to act generally as a stimulator to the entire distribution of this group. For the autonomic system no drug has been found which acts uniformly upon all parts of it. The nearest approach to such a drug is atropin, which is a sedative to practically the entire autonomic system, dilating the pupil, checking the flow of saliva and sweat, and relaxing contracted involuntary muscle.

Even more selective is pilocarpin, which has a powerful effect upon the salivary and sweat glands, producing over-secretion, and hence clearly to be regarded as a stimulator of part of this system.

Pilocarpin is known to be so reliable and constant a stimulator of the autonomic system that it is used in testing for the presence of vagotonia. One-twentieth to one-sixth grain is given hypodermically, and if the test is positive there will be noted salivation, lacrimation, sweating, cardiorespiratory, erythema and hyperperistalsis, all these out of proportion to the size of the dose.

The symptoms of vagotonia in general are such as would be expected when the autonomic system is stimulated, and they represent activity of function at the terminal distribution of the nerves concerned.

There are many of these symptoms, but just a few are mentioned to indicate their general nature.

Cramp of the ciliary muscle, spasm of accommodation and widening of the palpebral fissure are examples of what would result from hypertonus of the fibers from the ciliary ganglion.

Salivation and congestion of and hypersecretion from the nose and nasopharynx would follow irritation transmitted through the otic, sphenopalatin and submaxillary ganglia.

To the vagus itself can be ascribed many phenomena, such as bronchial asthma, bronchial hypersecretion, laryngeal crises,

bradycardia, gastric crises, hyperperistalsis and excessive gastric and intestinal secretion.

Through the sacral part of the autonomic system could pass impulses which would give rise to such conditions as spasm of the anal sphincter, hypersecretion from the intestine, dysmenorrhea, etc.

The blood picture shows an excess of eosinophiles.

The treatment of the condition is the same as that of any other secondary disease—viz., find if possible and eliminate a cause or focus, build up the health and give proper medication. The last factor, the medicinal treatment, can be managed on one of two principles, either administering a sedative for the autonomic system, or overcoming the tonus of the latter by giving a stimulator to its antagonist, the sympathetic system. This principle is illustrated notably by the successful treatment of spasmodic bronchial asthma, success being possible either by quieting the autonomic system with atropin or by stimulating the sympathetic by the local or hypodermic use of adrenin.

The writer cites a case in point:

A boy of twelve years, who had failed in health for five years and had an intermission or two of slight improvement. He presented many symptoms of autonomic tonus, and, in addition, had evident disease of his paranasal sinuses.

His impaired health dated back to an attack of measles at the age of seven, which left him with marked nasal discharge and expectoration, which have persisted ever since. There was at times a loose cough, which was productive of a thin, mucoid sputum, which never became yellow nor blood tinged. For a year there was profuse sweating at night, and his sleep was much disturbed by sneezing, coughing and expectorating. His adenoids were removed during this time, but the result was unfortunate, as immediately afterward his nasal discharge increased and he developed abscesses in both ears.

Three years after the appearance of the first symptoms, Dr. Stengel saw him. No cause for his symptoms was found, physical examination being negative. He was tested with pilocarpin for vagotonia by Dr. Hopkins, and the result was positive. He was put upon guaiacol carbonat and extract of belladonna, and some slight improvement resulted.

Two years later he returned to Dr. Stengel, a very sick little boy, having lost nine pounds in four weeks. At this time he was vomiting all his meals, a condition which soon changed to a weekly attack of severe abdominal pain, nausea and vomiting, which would last about two days. The vomitus was profuse and consisted almost entirely of mucus. With this there was profuse salivation, of a clear, watery character. Soon was added to these conditions frequent watery bowel movements. Medication was of little value, and the boy's condition was becoming a desperate one.

At this time the writer was requested to examine him, and aided by an X-ray examination a diagnosis of chronic suppurative in the posterior ethmoidal and sphenoidal cells of the left side was readily made. The surgical indications were clear, and he removed the posterior end of the middle turbinate and opened widely the offending cells.

Improvement was immediate and very striking, as almost at once his symptoms disappeared. In two months he gained ten pounds, and was a perfectly well boy except for some discharge from his nose. Later autogenous vaccines were given, and this was followed by almost total disappearance of the nasal mucus.

The interpretation of the case is this: The boy was one with a very unstable vegetative nervous system, and it has been observed that in such a state small stimuli can produce large reactions. The irritation which would cause such a condition of autonomic tonus may "arise from noxa in the form of bacterial toxins, as during or after acute infections, from drugs, or from the products of deranged metabolism, mechanical irritation, and so forth" (Hopkins).

There was present in this case a primary acute infection, measles, followed by prolonged chronic suppurative sinus disease, and we believe that the consequent toxemia and irritation were the exciting factors. For, when this was relieved, the widespread vagotonic symptoms disappeared so promptly as practically to bar accidental coincidence.

As far as the writer has been able to discover, the case is the first on record in which such a distinct entity as chronic sinus disease was presumably the exciting cause of such widespread vagotonic manifestations, and in which prompt disappearance

of these symptoms followed relief of the local condition. By the free drainage of suppurating sinuses this patient was almost instantaneously relieved of salivation, cough, expectoration, severe abdominal pain, vomiting and diarrhea, for none of which symptoms a physical cause could be found.

As a sinus case per se there was nothing notable about it, as the diagnosis was easy and the treatment simple. The big feature is the field of observation and deduction such a case opens up. It does seem that many other conditions which are but vaguely understood may possibly become clarified when viewed as vagotonic or sympathicotonic phenomena. For example: The treatment of bronchial asthma with adrenin or with atropin has been successful in many instances.

Noteworthy has been the nasal treatment by our colleague, Emil Mayer, Brettauer and others, of selected cases of dysmenorrhea.

Another fellow member, Greenfield Sluder, after painstaking study, has succeeded in relieving certain symptoms by treating the sphenopalatin ganglion.

These are but few of the conditions upon which some light may be shed. Undoubtedly, many others will suggest themselves as being based upon a derangement of visceral nerve supply. Should such prove to be the case, they will constitute a new group whose pathology can be described in definite terms.

DISCUSSION.

DR. G. HUDSON MAKUEN, Philadelphia: This most timely paper by Dr. Fetterolf is exceedingly interesting to me because it expresses very well and emphasizes again the close relationship which exists between our own specialty and that of neurology and general medicine.

DR. J. GORDON WILSON, Chicago: The advantages offered by the supporters of the vagotonic hypothesis are that it offers a plausible interpretation and suggests a rational treatment of certain types of neurosis. As it deals so largely with the vagus nerve, the nerve which innervates so many of the parts we specialize in, it is incumbent on us to learn on what basis this hypothesis rests.

Eppinger and Hess, whose statement is authoritative, state

that "vagotonia is a functional increase of tone in the autonomic system, which permits stimuli to act more readily on it," and regard it as a state of stimulation of the vagus. The vagotonic disposition is abnormal irritability. "Its cause is to be sought in disturbance of internal secretion, and it is present if we have increased sensitivity to pilocarpin."

If vagotonia is an increase of tonus in the autonomic system, it will be well here to inquire what is the conception of tonus that is usually accepted. Tonus is a difficult thing to define—it seems at times so intangible. There are three sets of phenomena to which physiologists usually apply this term.

1. Prolonged contraction of smooth muscle which is automatically independent of impulses from nerve centers.

2. A state of tension shown by skeletal muscles under certain conditions which in some way is dependent on nerve stimuli, for it disappears if these be cut.

3. State of some nerve centers which appear to give off constantly nerve impulses apart from the receipt of messages from other nerves—e. g., the respiratory nerve center.

It is with the last of these that we are chiefly concerned.

Dr. Fetterolf has sufficiently referred to the anatomy of the sympathetic nervous system ("vegetative system") and its two divisions, the autonomic nervous system (vagus group), and sympathetic nervous system proper. This division has been long recognized and acknowledged chiefly through the work of the English physiologist, Langley.

I do not intend to discuss whether or not the supporters of this theory have sufficiently differentiated between stimulation of a nerve and nerve tonus. I wish, rather, to call your attention to what is one of the fundamental propositions on which this vagotonic hypothesis is built. Eppinger and Hess say that tonus in the vegetative system is due to the equilibrium of two impulses, one from the autonomic and one from the sympathetic system, caused by two hormones antagonistic to each other. Hormones, as you are aware, are chemical messengers by means of which the activity of certain organs is coordinated with that of others; produced in one organ, they are carried to another, which they affect, even when present in very small amount. The supporters of the vagotonic theory assume as a fundamental fact that sympathetic tonus is produced by

adrenalin, and to get a corresponding hormone for the autonomic system, they further assume, without any evidence, the existence of an unknown hormone akin to pilocarpin. According to them, these two hormones, the real and the hypothetic, acting in antagonism to each other, produce normally a state of equilibrium. A departure from this state of equilibrium constitutes in the autonomic system vagotonia.

The first point I would make is that in their attempt to establish the equilibrium essential to their hypothesis, they assume as proved beyond doubt that adrenalin acts to produce tonus. Most recent investigations appear to show that adrenalin does not produce tonus in the sympathetic system.

To get over the difficulty of the assumption of an unknown hormone to act on the autonomic system, they assume that this hypothetic hormone will act like pilocarpin. Pilocarpin is a chemical body which acts directly on the cell membrane and produces morphologic changes in the cell. It seems to me that there are serious objections to a hypothesis which demands that we grant to it for a basis an unknown hormone comparable in action to a chemical body. It would, therefore, appear that the fundamental basis on which this hypothesis is built is not generally accepted, and is open to very serious objections.

Again, it is assumed that the glands of internal secretion, the endocrine glands, control the sympathetic system, and that they produce and stimulate the tonus of the vegetative system. This appears to me to be an assumption beyond the point we are justified in going. Experiments with these glands, such as feeding with these glands and removal of these glands (e. g., pituitary and thyroid), show that their action is not so restricted, but that they affect the growth of many of the body cells. It would be more correct to say that it is generally accepted that the endocrine glands act on tissue metabolism, and so indirectly affect the condition of the nerve cell.

There might be quoted other examples of the unreliability or doubtfulness of the assumptions demanded by this hypothesis. Equally unreliable appear to be some of the applications of the hypothesis. It is stated (Eppinger and Hess) that "the stomach dilates actively in proportion to the degree of filling, thus causing the muscular elements to cover the contents close-

ly. Tonus is, therefore, a resistance to filling." The meaning here is not quite clear. The two consecutive sentences do not fit in unless one lays emphasis on the "resistance to filling." The meaning appears to be that as the filling increases so does the tonus. We find that experimental evidence does not bear out the statement that tonus varies in proportion to the degree of filling. Tonus can only be measured by the tension of the muscle, and Sherrington has shown that the muscle wall of the living stomach can increase from an one hundred cubic centimeter posture to a five hundred cubic centimeter posture without change of tension. Also the reverse of this holds, for there may be loss of three hundred cubic centimeters without fall of pressure.

Vagotonia is a difficult subject to discuss, because it is based on the physiology of the sympathetic system and of the endocrine glands, much of which is unknown and much of which is speculative. The subject of the action of the sympathetic system in health and disease is a very important one, and if "vagotonia" has directed the attention of the clinician to this very important subject, it has served an excellent purpose. When from experience we find that atropin or pilocarpin is of use in diseases associated with the sympathetic or internal secretive system, we are justified in using them, but to build a system of medicine on so slim a basis as the clinical use of drugs is to court disaster.

In concluding, let me quote the words of Elliott, one of the leading investigators of the glands of internal secretion: "Medicine owes no debt of gratitude to those who teach to her theories without proof."

DR. THOMAS HUBBARD, Toledo: I am surprised Dr. Fetterolf did not include esophageal spasm in the same category as bronchial spasm. I would include also the globus hystericus, the various types of esophagismus, and also cardiac spasm.

DR. EMIL MAYER, New York City: It seems to me that we have with all this entirely wandered from the question of vagotonia pure and simple. We have to explain some of the things we have not understood, as, for instance, the effect in treating for dysmenorrhea, as mentioned by the speaker. Above all, the immensely practical value in that is to always remember that when we have done anything surgical for our

patients, our efforts must cease, we must not be surprised if the patient does not get well, and we must not put them down as being nasal hypochondriacs.

I have a case in mind of a gentleman who came to consult me recently. He had been having an ethmoiditis. The operation on his nose had been very properly and carefully done, but he was still having terrific headaches. He was one of those men who was determined to find out what the trouble was, and he was sent to me. I told him that so far as the nose was concerned, there was nothing to do for him surgically. He said that he was still having the discharge and still having the headaches. A vaccin of his secretion had been made, and he had received injections, but nothing had helped him. I noticed his tongue was very much furrowed, and inquired very carefully into the question as to whether he had syphilis. He said, "No"; he had absolutely no knowledge of it. A Wassermann test was made which proved negative. He even brought his sister to me, and she submitted to a most careful examination, and there was nothing found. I sent him to a dermatologist, and he said it was probably a case of hereditary syphilis, and he advised salvarsan and mercurial injections. The patient has now become entirely well, and as soon as he has any symptoms, a mercurial injection always makes him well.

I quote this case because it seems to have a marked connection with the subject at hand, and to show that we must remember that a patient has something else besides nose and throat.

DR. JOSEPH L. GOODALE, Boston: In view of what we know takes place in a child who is weaned and that which takes place also in conditions of asthma and in other anaphylactic conditions, this may possibly be an indication of the underlying identity of these various conditions.

DR. G. HUDSON MAKUEN, Philadelphia: I am particularly pleased that Dr. Fetterolf should have brought this subject before the meeting, because I have long been of the opinion that we as laryngologists and otologists have been giving rather too much attention to the surgical side of our specialty, to the exclusion, or perhaps neglect, of the neurologic and medical side of it. I, therefore, think that this discussion is very timely and very important. I am of the opinion that in the near future

our work will deal perhaps less with surgery and more with the general phase of the subject.

DR. GEORGE FETTEROLF, Philadelphia (closing the discussion): In answer to Dr. Wilson, I would like to quote the reply to what was said about four years ago by Dr. Meltzer with regard to a certain criticism that a subject was five per cent fact and ninety-five per cent theory, but that a working hypothesis is better than none.

In answer to Dr. Hubbard, I would say that I have been busy during the last two months cutting a sixty-page paper down to thirteen pages. There are a great many phases that I have not been able to touch upon, and a great many symptoms and signs that I did not have the space to take up.

If anyone is interested in this, the most recent things which have appeared are a brochure by Eppinger and Hess, translated by Jeliffe and Kraus, and an exceedingly able article by Barton, which appeared in the Transactions of the Association of American Physicians in 1905.

Removal of a Large Rhinolith, With Exhibition of Specimen.

BY D. BRADEN KYLE, M. D.,

PHILADELPHIA.

Patient, male, aged seventeen years. The right nostril was markedly obstructed by the septum, which was deflected and perforated by pressure from the body in the left nostril. This obstruction in the left nostril was found to be extremely hard, almost black in color, and covered by a great quantity of mucopurulent secretion of bad odor. This object was large enough to fill the entire naris; it forced the septum to the extreme right, extending into the antrum, and could be felt projecting backward into the nasopharynx. It was freely movable and not attached at any point—pocketed, as it were.

An operation was performed October 8, 1914, under ether anesthesia. Attempts to remove the obstructing body in its entirety failed, owing to its large size and to the fact that it bore the relation to the surrounding bony structures of a ball to its socket. It was necessary to use heavy rongeur forceps, by means of which it was possible to break off small fragments from the granite-like mass. About one-third of the body was

removed in this manner, when the remaining portion was removed entirely with only a slight tear at the nasolabial angle. The nose was packed with iodoform gauze. The entire operation occupied about one hour, and considerable blood was lost. The patient was cyanotic and in shock when taken to the ward.

Twenty-four hours after operation a distinct pneumonic area had developed in the lower left lung, and the patient was removed to the medical ward for treatment of this condition, which cleared up in due time. During the four or five days following the operation there developed considerable emphysema of the cellular tissue at the root of the neck and below the clavicles. The face was markedly swollen and the eyes puffy. By the 17th of October a distinct abscess had developed at the inner canthus of the left eye. This was incised by Dr. Sweet, and found to communicate with the anterior ethmoid cells. This complication being relieved, and the lung having become clear, the patient was returned to the special ward on October 19th, where he made an uneventful recovery, and left the hospital on November 11, 1914.

DISCUSSION.

DR. HARRIS F. MOSHER, Boston: The objection brought out by the speaker that the case was septic and he did not feel like working the incision through the cheek, does not seem a valid one. You can get perfect drainage in this way. Had he gone after the tumor by making that incision, I feel that he could have seen what he was up to and stood a very good chance of getting his tumor out whole, which, of course, to any surgeon, is a certain amount of satisfaction.

DR. D. BRADEN KYLE, Philadelphia (closing the discussion): I would like to say that this tumor weighed two hundred and fifty-four grains. It seems to me that if you can remove a mass without any serious trauma to the patient, you are highly justified, for the satisfaction of having the entire rhinolith, to subject the patient to a major operation. But in this case one could not possibly extend into the nasopharynx and not have trauma without doing a very extensive operation and splitting the whole upper jaw. I feel that in this case removing it in small portions was a much better surgical procedure than the one mentioned.

Sarcoma of the Nose—Report of a Fatal Case, With Metastases in the Cervical Glands and in the Brain.

By J. PAYSON CLARK, M. D.,

BOSTON.

A female, sixty-four years old, noticed a swelling on the nose for four months. When first seen by the writer it was about the size of a small marble. For a month there had been a slight bloody discharge from the nose. There was a dark purplish tumor visible on the outer wall of the left nostril just above the vestibule. The growth was completely removed. The microscopic diagnosis was either carcinoma or sarcoma. In two months a gland was felt under the left side of the jaw. This was excised and proved to be a spindle cell sarcoma, thus determining the nature of the original growth. Seven weeks later a gland was palpable under the left sternomastoid muscle. Coley treatment was tried, without apparent success, for two months. At the end of this time a small recurrence was found in the nose and removed, and a month later a complete glandular dissection of the left side of the neck was successfully done. Three weeks later the patient developed mental symptoms, incoherent talk, convulsive attacks, motor aphasia and dysphagia. At times she was very drowsy, and then restless and irritable. She soon lost power of locomotion and control of sphincters. She became very comatose and hard to rouse, and ate practically nothing for the last ten days of life. An autopsy showed three metastases in the brain.

The most interesting features of this case are the metastases in the brain and cervical glands. The writer could find but eight reported cases of sarcoma of the nose in which metastases were said to have occurred. Six of these cases are somewhat doubtful, leaving only two (besides the case here reported) in which metastases occurred in the cervical glands, and only one other case in which they occurred in the brain.

DISCUSSION.

DR. ROBERT C. MYLES, New York City: The question of sarcoma of the nose and accessory sinuses is an interesting one to me because of the optimistic feeling I have with regard to

it. A few years ago I had two cases of sarcoma in the frontal sinuses, and by a complete operation and removing the bone extensively and all the periosteum, I was able to get a good result. One of the cases had invaded the orbit. It is now more than seven years, and neither of them has recurred.

Twelve to fifteen years ago I reported a case where the whole of the nose was involved, in which everything was removed very deeply, and that has not recurred.

About two years ago I had a case of extensive carcinoma, which first appeared to be sarcoma, involving the external wall and ethmoid, in which everything was removed—the antrum freely taken away with extensive removal of the periosteum. That patient, to my surprise, has had no recurrence, and since that time has developed remarkably physically and in every way. So that I don't know what it is that causes such dread of these cases. Personally, I think the good results must be something more in relation to the periosteum than to the bone. If that is thoroughly removed, even if you have to leave the bone, as you do especially when one of the orbital plates is involved, there is still a lot of hope. I think we ought not to let these cases go on. I remember the case of a woman who had sarcoma of the septum, and for the reason that we did not remove her septum to the cribriform plate, she died of metastases in the brain. With that idea of conservatism we did not remove the whole septum, and I think it was a mistake.

DR. J. PAYSON CLARK, Boston (closing the discussion): Of course, we have all seen a great many cases of sarcoma which have gotten well after thorough removal, but in this case of mine I feel that there is no question but that the glands of the neck and metastases in the brain had already occurred before I operated. I am led to that view from the fact that, apart from the slight recurrence in the nose, there was nothing to suggest the probability of extension of the growth. This was not a direct extension of the growth to the brain, but the growth was carried through the lymphatics.

Brain Abscess From Chronic Suppuration of the Frontal Sinus.

By T. PASSMORE BERENS, M. D.,

NEW YORK.

In a previous communication the writer reported a case of this affection, with a record of forty-nine other cases found in the literature.

Since then six other cases have been recorded, and are herewith briefly narrated, to which the following is now added:

A male, aged thirty years, was operated on January 16, 1913, under gas-ether anesthesia. Radical external frontal and sphenoidal operation and opening of the antrum of Highmore through the nasoantro wall. Slow convalescence.

In December, 1913, pus in the nose. Old wound reopened through the nose and washed out. This had to be repeated in July of the following year. In December of the next year recurrence of discharge, and on January 5, 1916, there was a large swelling of the cicatrix in the right frontal region and headache, and the old wound was opened under anesthesia. Much pus flowed from the wound, and also from the antrum, which was opened.

Granulations in the roof of the sinus hid a perforation which led to a cavity two and one-eighth inches from the roof of the sinus. This opening was gently enlarged, and a horse hair drain placed therein.

Finally, a soft rubber drain was inserted, and the discharge continued for five weeks. The wound was not allowed to heal for some weeks thereafter.

Culture from brain showed streptococcus hemolyticus in pure culture, and the same were found in blood culture in small numbers the day after the operation.

Recovery complete except that there was still considerable discharge of pus from the left nostril.

Operations on Tonsils and Adenoids in Diphtheria Carriers.

By THOMAS HUBBARD, M. D.,

TOLEDO.

Classification of diphtheria carriers: (1) Primary or healthy carriers. (2) Secondary carriers.

1. Have never had clinical diphtheria showing perfect immunity toward the diphtheria bacilli found in nose and throat.

2. Includes persons who have had clinical diphtheria one or more times, and in whose secretions diphtheria bacilli can be found twenty-one days or more after last attack.

Local treatment is very unsatisfactory, as most of these cases have enlarged tonsils and adenoids, and crypts cannot be reached by antiseptic applications. However, it should be added that certain cases must be treated in this manner until in condition for the radical surgical method, and occasionally it will be successful.

Thorough tonsillectomy and adenoidectomy are proving very efficient in cleaning up carriers.

In group one, operations—that is, tonsillectomy and adenoidectomy—can be undertaken with confidence that the person is perfectly immune. In spite of the fact that false membranes appear in tonsillar fossæ, these patients recover in ordinary period.

In group two it must be borne in mind that the immunity is not dependable. Each case must be studied carefully. Immunity test of Schick, made before the time of operation, will aid decision.

In all of these cases exhibiting transient immunity the question of antitoxin naturally comes up. Anaphylaxis must be taken into consideration, tests of sensitization, etc., and all precautions taken in administration of serum at such intervals.

The physical condition, together with the skin reaction tests, should decide whether or not the patient is in condition for operation.

Case Report.—Secondary type. A carrier for several months after second attack of diphtheria. Immunity very transient. Recovery in one week after operation, even though genuine diphtheritic pseudomembrane was extensive. No diphtheria bacilli after ten days.

DISCUSSION.

DR. STANTON FRIEDBERG (as guest—by request): This problem of carriers was called to our attention several years ago by the fact that we had patients who, on account of having positive cultures in their throats, were compelled to remain

in the hospital for weeks, sometimes fifty to sixty days. As we only have a limited capacity (thirty to forty beds), this was a serious problem, for here we had clinically well patients occupying beds which we really needed. We experimented along various medical lines without any particular effect in some of the cases, and it was then that Kale was brought out in these cases. In spite of all the local treatment we found that there were a number of cases that would not clear up, but had to remain in the hospital forty or fifty days. In these cases I would urge nasal cultures as well as pharyngeal, for we frequently found that we had positive nasal cultures when there were no positive pharyngeal cultures.

A certain class of these cases will clear up under medicinal treatment. We have tried out vaccins without any particular effect. The feasibility of medical treatment in some of these cases we can illustrate in this way: We know that we find the bacilli in the depths of the crypt, where it is impossible to reach the condition. It is here also discovered in the epithelium, and that perhaps explains why we do not get any effect from local applications of medicine.

As to those cases which involve the nasopharynx and the nasal accessory sinuses, as Dr. Hubbard has mentioned, the accessory sinus cases are the hardest ones to deal with. To illustrate the futility of the use of the staphylococcus spray, I would cite a case in which we were deterred from using this method—a case where meningitis followed its use.

In the case of a child between two and three years of age, who had nasal discharge, a mixed infection, staphylococcus unilateral with diphtheria bacilli constant, there were repeated cultures which were always positive. The house physician looked into the nose and found a shoe button there which was keeping up the local infection, and upon removing the shoe button it cleared up immediately.

We have had other cases where the culture removed remained positive in chronic rhinitis, which may possibly have been some ethmoid involvement. There are a number of points which might be brought out that are most interesting. One condition which we ought to consider is the occurrence of the postdiphtheritic paralyses. I do not know whether any work

has been done in these cases or not. There was a question in my mind as to whether or not the constant harboring by the tonsil of toxins thrown out continually did not produce these paralyses. It would be interesting to investigate peripheral neuritis. I would like to do it if I get the cases, for I think it would be an interesting fact to determine.

We have made it a practice to give medication a thorough trial. We took the Shick skin reaction, operating only in six cases in which the reaction was negative. We have not used anything after operation. We have taken the nasal cultures and other cultures afterwards, so that our results would not be influenced by any application made to the throat. It is common in large hospitals for cultures to be taken after an application is made to the throat, and in the event of securing three negative results to let the patient go out. We determined to eliminate that factor entirely. The results after operation have not differed in any respect from those seen ordinarily. I reported several months ago six cases in which we had removed the tonsils and adenoids, where the results were startling. The next day after operation, without any application at all, the cases cleared. We took cultures for five days afterwards, and each time they were negative, except in one case, in which the nasal cultures remained positive.

The whole question is very important, and a simple reference to the literature will show a gradual wave in the curve of the amount of work contributed to the study of carriers in recent years.

DR. ROBERT CLYDE LYNCH, New Orleans: My experience in this direction covers twelve or fourteen cases, and there are a few points I would like to bring to your notice. First of all, there are twenty or more varieties of pseudopathic bacilli in which the microscopist appears almost unable to absolutely and faultlessly tell the difference between the true organism and the pseudo variety. I think this is important, for frequently we might be dealing with a pseudo variety.

The second point is in relation to a little matter of technic in the administration of antitoxin in patients who have been previously sensitized by the administration of horse serum. The patient is given a small dose just above the ankle, and

there is a constrictor ready for application above the knee; three or four drops are injected just under the skin above the ankle, and the constrictor ready. Sufficient time is allowed for the development of the anaphylactic symptoms, and if they do not develop in one-half to three-quarters of an hour, the injection can be made. If they should develop, the constrictor is applied.

I would like to report a case of a medical student, who had rather a virulent attack of diphtheria, which yielded to twenty thousand units of antitoxin. The patient gradually got well and finally had two negative cultures, with a normal temperature four days, and was ready for discharge. Suddenly there was a rise of temperature to 99° , and the appearance on the surface of the tonsil of acute follicular tonsillitis, which gave a culture of probable diphtheria. This was fourteen days after the first injection of antitoxin. We proceeded again to give him 120,000 units, and he was discharged. Six weeks later he came walking in on crutches, just able to get about, with paralysis of the soft palate and extensor muscles of the extremities, and suffering from constipation, which he had never had before. This man's cultures were taken and shown to be positive from the tonsils. He was treated locally without any result. Tonsillectomy was done, and in two weeks after the tonsillectomy the paralysis entirely disappeared without further medication.

Another case in which tonsillectomy was performed for carrier yielded nice results as far as the operation went. The cultures remained positive—nasal as well as throat cultures. We have taken cultures of both nostrils separately, and in this case we determined the discharge was coming from the antrum. We made a large opening into the anterior meatus and irrigated the antrum with buttermilk. The use of buttermilk has also cleared up some of the diphtheria carriers.

Another striking feature was that in nine out of the fourteen cases in which we could determine the form of organism coming from one or both tonsils, when the tonsils were removed we could not determine any organism in the tonsillar material. Yet all the cases cleared up immediately after tonsillectomy, and in none of these cases was the reformation of membrane in any way different from the usual case of tonsillectomy.

DR. ROBERT C. MYLES, New York City: This is a subject which interests me in a practical way, because of the fact that in many of the hospitals we frequently find children who have chronic nasal trouble with bacilli, without any other evidence of disease. The subject at hand would then be, what relation would a child having diphtheria carriers, but without any other evidence of diphtheria, bear to the other children in the home? I have had some very difficult propositions to contend with at times—sometimes the bacilli were found, and sometimes not, with the Board of Health inquiring, and the child is absolutely well and a perfect specimen of health at the time. I think this is a matter of important consideration. Of course, it is a purely local question, and our education of the Board of Health is one of the most important things in the matter.

DR. THOMAS HUBBARD, Toledo (closing the discussion): All the study of the primary cases of carriers, without ever having clinical evidence of the disease, is largely institutional work, and to some extent also secondary cases. This latter group, however, have some diphtheria and are still diphtheria carriers. It is going to be put up to laryngologists to help them out in this matter, and by another year I hope to have records of many more cases and to arrive at definite conclusions.

Epithelioma of Posterior Pharyngeal Wall Cured With the Electrocautery.

BY DUNBAR ROY, M. D.,

ATLANTA.

Female, aged twenty-seven years, first seen July 29, 1913. Previous and family history negative. Present history: For last three months had suffered with a soreness and throbbing in her throat. Had been treated continuously without result. Examination showed a rounded ulcer on the posterior pharyngeal wall at center, one-half of which was hidden by the soft palate; dirty grayish in appearance, with edges sharply defined; about one-half inch in diameter, and extending as deep as the superficial aponeurosis. A piece excised showed it to be an epithelioma.

Removal by means of the electrocautery point, well outside of its edges. No reaction and no discomfort followed. Healing perfect under one application. After three years there are no signs of a return.

Unfortunately, clinical observers are too prone to classify all malignant growths of the throat under the general term cancer, without distinguishing between the different forms of carcinoma and sarcoma. This statement is made because the writer has found it almost impossible to correlate all cases recorded, in that many of them were reported in the most unexpected places, and not under the headings where one would expect to find them. As Morell McKenzie and others have pointed out, the disease is often so extensive when first examined that it is impossible to tell its point of origin.

Textbooks are very vague in the discussion of this subject. It has now been three years since the case here reported has been healed, and there has been absolutely no signs of a recurrence. The results obtained in one case, especially of the cancerous type, certainly do not justify any positive deduction, but the writer believes that the thorough and judicious use of the electrocautery offers the best chance for a good result.

DISCUSSION.

DR. J. SOLIS COHEN, Philadelphia: I have been very glad to hear the paper by Dr. Roy, because it exemplifies the opinion that epithelioma, taken early, before there is any glandular involvement, can be cured. The method which he adopted is an excellent one. In the first place, he eliminated the growth, and a certain portion of healthy tissue around it, with the cautery. The heat of the cautery extended and cooked some of the area around that growth, and entirely getting rid of the growth, he of course had a normal return of tissue. He got rid of the entire growth except as far as the scar tissue was concerned.

Some time previous to the twenty years' investigation which he spoke of, I very well remember a case in the clinic of the Jefferson College Hospital. It was a case in which there was a spontaneous cure of a growth similar to the one mentioned, about the size of the end of the thumb. A portion was re-

moved with forceps for examination, and in the interval waiting for the report the patient was allowed to go home. I powdered the area and let him go; he was a carpenter, sixty years of age. The man was instructed to return at the next clinic, and when he did so he looked better, and nothing else was done. The specimen was reported as epithelioma. I do not, however, attribute it to the powder, but have always looked upon it as a case (such rare cases have occasionally been reported) of spontaneous retrogression of a pharyngeal epithelioma.

DR. CORNELIUS G. COAKLEY, New York City: I think the case of Dr. Roy is exceedingly interesting. It presents one phase, however, to my mind, which is a little doubtful, and that is, that I understood the patient was examined only in frozen section. I think most pathologists will feel a little bit in doubt as to their examination of a frozen section.

The next point is the unusual absence of glandular involvement in this area. I have never seen a malignant process, even fairly early, on the posterior pharyngeal wall, that did not have the glands involved. It may have been some particular type of cancer—some peculiar form, different from the average type which we ordinarily see.

The next point is one which I think we ought to take up seriously, and that is the absence in the literature of records of cases of involvement of the nose, throat, accessory sinuses, pharynx and larynx. Within the last year I personally ran across at least one dozen cases of malignant disease of rather unusual type—ethmoidal, maxillary, etc. I had one case recently involving the sphenoid and nasopharynx—whether primary or secondary, I could not tell. Those cases are unrecorded in the literature, and I have no doubt that those of us who are working in large clinics have numbers of these cases. I think we should report all cases of malignancy seen during the year and have them tabulated in some form for reference. It is really surprising to note the relative frequency of these cases as compared with the actual records.

DR. D. BRYSON DELAVAN, New York City: There is nothing so uncertain about the prognosis in a case of so-called epithelioma. I say "so-called," because we cannot get further in-

formation histologically than the microscope is able to give us. When the microscopic examination is made and the findings reported, there our information ends. There are in the recollection of most of us isolated cases which differ entirely in their result from the average. For example, the solitary case upon which Dr. Elsberg operated at different times for a dozen years, and upon which Dr. Cohen operated twenty years after its inception, in which the patient lived fifty years after the first operation. That is a long while for a patient to survive epithelioma.

In contrast to that which represents a type now and then spoken of and recorded amongst thousands of others, I had a case of epithelioma of the epiglottis which was discovered so early that the growth was only about half the size of a split pea, one-quarter of an inch in diameter, on the extreme margin of the epiglottis. In that case one-third of the epiglottis was thoroughly removed, as far down as possible, and the disease apparently completely extirpated. After four or five years there was another mass there—a perfectly normal healthy condition—and then the patient redeveloped the disease, from which he died after a comparatively short course.

Now, that case is instructive because it shows that if we operate, as we suppose, far and wide out of the lesion itself, nevertheless structures in that neighborhood may have already become involved after all, and with the lapse of time the involvement will appear and the disease go on, in spite of all treatment, to the destruction of the patient.

We know about this subject and the number of such cases that have been studied all over the world, and reference to the poverty and misleading nature of the statistics is very timely. I called your attention yesterday to the work of the Society for the Prevention of Cancer. I wish now to bring that before you again, and to urge as forcefully as I can the desirability of carrying out the suggestion of the last speaker. As chairman of that association, I can say that the association stands ready to give all the aid it can to any institution which may interest itself in the matter of statistics. Apparently, this is now the thing most needed. I hope this society will bear that in mind. Each man here is a central influence in the place

where he lives, as well as in the vicinity of that place, and I hope each man here will do the best he can to help forward this work for the study of cancer.

DR. DUNBAR ROY, Atlanta (closing the discussion): In reply to Dr. Coakley, there was a frozen section made for diagnosis, and later on this was confirmed. The case was operated upon, however, under the diagnosis of the frozen section.

I have nothing further to add, except the fact that anyone who has had any of these cases and tried to look up the literature, will know what an awful burden it is. It is almost impossible to get anything whatever. With the majority of writers "cancer" seems to be a general term, used to cover everything; one gets into a labyrinth of cases from which nothing can be made out. The words of Dr. Delavan are very timely, indeed. We certainly ought to be a little more scientific and get every case recorded as far as possible, as from its point of origin.

Extensive Cholesteatoma Following the Luc-Caldwell and Killian Operations, Simulating Sarcoma. Case Report.

BY VIRGINIUS DABNEY, M. D.,

WASHINGTON, D. C.

Man, forty-two years of age, gave no subjective symptoms of his grave condition other than nasal stoppage. Exophthalmos marked, deviation of septum complete, polyps in middle strait. Acute exacerbation three days later. Luc-Caldwell operation and extensive exenteration of ethmoid bone, with subsidence of symptoms. Five days after this, symptoms returned, and Killian operation done, with perfect functional and cosmetic results. Eleven days later abscess in cheek formed and was evacuated by incision below and parallel to the lower eyelid. Great distension of cheek, frequent spontaneous hemorrhages, convincing radiographs and wooden-like hardness of mass in cheek suggested sarcoma. Two months later, operation revealed immense collection of true cholesteatoma; odor overpowering; all bone above, below and on each side of mass eroded and totally destroyed, including floor and inner wall of orbit, two-thirds of malar bone and all of outer

wall of antrum. Present condition of patient, marked asthenia; death only matter of short time. Syphilis, tuberculosis, malignancy, all excluded by proper methods.

DISCUSSION.

DR. OSCAR A. MCKIMMIE, Washington: I had the privilege of seeing this case a number of times with Dr. Dabney before operation, and of being present and helping him with the operation which he has detailed. He has given a very complete report of the condition as it existed, and there is very little I can add about the case except to explain that the condition might very readily have given rise to a misleading interpretation of the X-ray plate. The superior process of the bone was the thickest bone I have ever seen in living subject or in dead. One portion of it was at least one-half inch thick, solid and ivory-like in character, and these cells in the ethmoid which Dr. Dabney has referred to, I have never seen in a living or dead subject. They were very hard and extremely thick; and this explains very readily why at the operation it was impossible to get away all the cells. At the secondary operation it was shown to be a very dense bone, either an anomaly of development, or the result of chronic inflammation.

The question of the origin of the cholesteatoma is an interesting one. There is no question as to the character of the mass, because all its clinical appearances and the laboratory findings proved it to be cholesteatoma. The mass taken out at the secondary operation, I should say was as much as one could hold in the hand. The swelling from the malar bone to the bridge of the nose was a perfect straight line, and the odor was something that I have never experienced in an operating room before. My own impression is that this secondary infection, of whatever type it was, which was associated with this sinus, was probably the starting point of the cholesteatoma formation.

DR. JOSEPH H. BRYAN, Washington: I have seen one or two instances where there was ivory hardness of a white, previously soft mass, where we found suppurative conditions of long standing. It probably was an osteitis which eventually produced this cholesteatoma mass.

DR. VIRGINIUS DABNEY, Washington (closing the discussion): I did not go into details about how I arrived at the conclusion, except that it was examined under the microscope by a pathologist. Cholesterin crystals were found, and this would confirm the diagnosis. I think Dr. McKimmie's theory is a very tenable one. The hole was right here, and we never made it heal; nothing would make it heal; it is open now.

